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UMATILLA BASIN NATURAL PRODUCTION MONITORING AND EVALUATION

ANNUAL PROGRESS REPORT 1995- 1996

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ABSTRACT

This report summarizes the activities of the Umatilla Basin Natural Production Monitoring and Evaluation Project (UBNPME) from September 30, 1995 to September 29, 1996. This program was funded by Bonneville Power Administration and was managed under the Fisheries Program, Department of Natural Resources, Confederated Tribes of the Umatilla Indian Reservation.

An estimated 56.1 river miles (RM) of habitat (1,657,577 m^2) was inventoried on the lower Umatilla River (RM O-56.1) from June 4, to August 1, 1996. The majority of the lower River was found to be too polluted and physically altered to provide suitable rearing or migration habitat for salmonids during the summer. High water temperatures, irrigation withdrawals, altered channels, and urban and agricultural pollution all contributed to degrade the lower Umatilla River. Small springs provided cooler waters and created small areas that were suitable for salmonid rearing. The river below the mouth of Mckay Creek (RM 27.2 to 50.6) was also cooler and more suitable to salmonid rearing when water was released from Mckay Dam.

Two hundred sixty-three of 1,832 (14.4%) habitat units were electrofished from June 19 to August 29, 1996. The number of natural juvenile salmonids captured between RM 1.5-52.4 follow: 141 juvenile steelhead (including resident rainbow trout; *Oncoryhnchus mykiss*), 13 mountain whitefish (*Prosopium williamsoni*, including adults), four chinook salmon (0. *tshawytscha*) and two coho salmon (0. *kisutch*). The expanded population estimate for the areas surveyed was 2,445 salmonids. Mean density was 0.147 salmonids/100 square meter (s/100 m^2). Mean density of fast water habitat types was 4.5 times higher than slow water types (0.358 and 0.079 s/100 m^2).

The following number of non-salmonids were visually estimated or captured: 34,3 18 speckled dace (*Rhinichthys osculus*), 24,108 redside shiners (*Richardsonius balteatus*), 7,266 suckers (*Catostomus spp.),* 4,820 chiselmouth (*Acrocheilus alutaceus),* 1,480 northern squawfish (*Ptychocheilus oregonensis),* 1,202 sculpin (*Cottus spp.), 60* carp (*Cyprinus carpio*), 23 smallmouth bass (*Micropterus dolomieui*), *two* brown bullhead (*Ictalurus nebulosus*), one adult lamprey and one ammocoete (*Lampetra tridentata*), one bluegill (*Lepomis macrochirus),* and one pumpkinseed (*Lepomis gibbosus).* The expanded estimate of non-salmonids was 1,580,249. The estimated ratio of non-salmonids to salmonids was 455: 1.

We monitored relative abundance, seasonal distribution and habitat utilization of salmonids at index sites throughout the basin. We electrofished 36, 39 and 37 index sites during the fall of 1995, and the spring and summer of 1996, respectively. Higher salmonid catch rates were generally observed in the Umatilla River at sites upstream of RM 81, in tributaries entering upstream of RM 73.3 and in East and upper West Birch Creek. Salmonid catch rates were consistently low in the downstream reaches of Birch Creek and the Umatilla River.

The rotary screw trap in the Umatilla River near Barnhart (RM 42.6) operated 41 of 44 days from October 10, 1995 to November 22, 1995. The trap captured 37 juvenile steelhead with a mean trap efficiency rate of 14%. A total of 42 juvenile chinook salmon were captured with a mean trap efficiency rate of 28.6%.

The rotary screw trap in the Umatilla River at the Imeques C-mem-ini-kern site (RM 79.5) operated 159 out of 276 days from September 7, 1995 through June 9, 1996. The trap was not operated during three high flow events when substantial emigration may have occurred. The trap captured 3,765 natural juvenile steelhead with a mean trap efficiency rate of 28.7%. A total of 2,135 juvenile natural chinook salmon were captured with a mean trap efficiency rate of 57.6%. A total of 803 juvenile hatchery chinook salmon were captured with a mean trap efficiency rate of 13.3 %.

The rotary screw trap in Meacham Creek (RM 1.5) operated 24 out of 29 days from May 8 to June 6, 1996. The trap captured 449 juvenile natural steelhead, 117 juvenile hatchery steelhead and one juvenile natural chinook salmon. Mean trap efficiency rates were 14.2 and 11.1% for natural and hatchery juvenile steelhead.

Scale analysis determined that 58.9 and 26.2% of naturally produced juvenile summer steelhead sampled during biological and index surveys were age 0+ or 1 + , respectively. Naturally produced summer steelhead adults, returning to the Umatilla River in 1995-96, were mostly from the 1991 (34.1%) and 1992 (63.6 %) brood years.

The number of adult anadromous salmonids available to spawn naturally above Three Mile Falls Dam (TMD, RM 4) included: 515 adult and 519 jack fall chinook salmon (1995 brood), 105 adult and 34 jack coho salmon (1995 brood), 1,186 natural and 617 hatchery summer steelhead (1996 brood), and 176 1 adult and 82 jack spring chinook salmon (1996 brood). Seven percent of the adult spring chinook observed at TMD were unmarked and likely natural. During fall (1995) spawning surveys we enumerated nine fall chinook salmon redds, one coho salmon redd and one unidentified salmon redd along nine miles of the mainstem above TMD (1.2 redds/mile). During March, April and May, 1996, we enumerated and flagged 121 summer steelhead redds along 21.7 miles of lateral tributaries of the Umatilla River (5.6 redds/mile). During August and September, 1996, we enumerated 347 spring chinook salmon redds along 30.0 miles of the mainstem (11.6 redds/mile, 5.1 adults/redd). We examined 740 carcasses or 40% of the spring chinook salmon released above TMD. Only 63.7% of the examined carcasses had spawned successfully. We collected snouts from 166 fish with clipped adipose fins from which 141 coded-wire tags (CWTs) were successfully recovered and decoded.

A study of the migration movements and homing requirements of adult salmonids in the Umatilla River was conducted during the 1995-96 return year. Radio telemetry was used to evaluate the movements of adult salmonids past diversion dams in the lower Umatilla River and to determine migrational movements of salmonids following upstream transport. Radio transmitters were placed in 30 summer steelhead, 20 spring chinook, 20 fall chinook, and 19 coho salmon, which were released at TMD. An additional 13 summer steelhead and 15 spring chinook salmon were tagged, hauled upstream, and released at either Barnhart (RM 42.2), Thomhollow (RM 73.5), or Bear Creek (RM 87.8). On average, summer steelhead required 36 days to successfully migrate from TMD to Stanfield Dam (RM 32.4). Spring chinook required 12 days. Average passage times for summer steelhead (hours and minutes) at Westland (RM 27.2), Feed Canal (RM 28.2), and Stanfield (RM 32.4) dams were 13:06, 39:54, and 05:52, respectively. Spring chinook salmon required 03:27 at Westland Dam, 43:54 at Feed Canal Dam, and 12:48 at Stanfield Dam. Migrational delays were observed at Feed Canal Dam at flows ranging from 834 to 2,506 ft^3/sec (cfs). Twenty-one percent of the fish used the fish ladder at Westland Dam, 53 % at Feed Canal Dam, and 33 % at Stanfield Dam.

Data related to homing and passage needs of adult hatchery salmon and steelhead was investigated in an attempt to maximize homing to the Umatilla River. Straying rates of adult summer steelhead and spring chinook salmon were found to be low while coho and fall chinook salmon straying rates were high in . some groups, particularly subyearling smolt releases of fall chinook salmon. Attraction flows of at least 150 cfs are required to encourage migration and reduce straying of fall chinook and coho salmon. Significant numbers of summer steelhead enter when flows exceed 500 cfs. Migrational entry for spring chinook salmon is variable with fish entering at flows ranging from 150 to more than 2,000 cfs.

We estimated that tribal anglers harvested 39 hatchery and no natural summer steelhead during the spring of 1996. There were an estimated 167 spring chinook salmon harvested during the 1996 tribal salmon fishery.

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INTRODUCTION

The Umatilla Basin Natural Production Monitoring and Evaluation Project (UBNPME) was funded by Bonneville Power Administration (BPA) as directed by section 4(h) of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501) and pursuant of measure 703 (F)(l)(b) of the Northwest Power Planning Council's (NPPC) Columbia River Basin Fish and Wildlife Program (NPPC 1987). This report summarizes work completed during the contract year September 30, 1995 through September 29, 1996. Work was conducted by the Fisheries Program, Department of Natural Resources, Confederated Tribes of the Umatilla Indian Reservation (CTUIR) in cooperation with the Oregon Department of Fish and Game (ODFW, see Appendix I, Table I-2 for abbreviations). This project was one of several subprojects of the Umatilla River Basin Fisheries Restoration Master Plan (CTUIR 1984, ODFW 1986) orchestrated to rehabilitate salmon and steelhead runs; subprojects include:

Natural Production Monitoring and Evaluation, and Adult Passage Facility Evaluations (this project);
Watershed Enhancement and Rehabilitation;
Hatchery Construction and Operation;
Satellite Facility Construction and Operations for Juvenile Acclimation and Release and Adult Holding and Spawning;
Trap and Haul Juvenile and Adult Salmonids Around Dry Reaches Below Irrigation Diversions;
Juvenile Passage Facility Construction and Operation;
Juvenile Passage Facility Evaluations;
Evaluation of Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River Basin;
Adult Passage Facility Construction and Operation, and
Flow Augmentation to Increase Instream Flows Below Irrigation Diversions.

The approach to monitoring and evaluating the natural production in the Umatilla River Basin includes three phases. Phase one includes collecting baseline data relating to life histories, distribution, abundance, survival and the current and potential production of anadromous salmonids from the Umatilla Basin. Phase two involves the creation of a streamlined monitoring program developed and tested through completion of tasks in phases one and two. Phase three consists of risk containment monitoring where the monitoring program will be employed. Phase one of the UBNPME plan was scheduled for 1992-97. Phases two and three are scheduled to begin in 1997 and 2004, respectively.

The UBNPME program's 199596 goals were to evaluate the implementation of the Umatilla River Basin Fisheries Restoration Plan with respect to natural production, adult passage and tribal harvest. This report follows the statement of work's outline. Project objectives are listed below.

Objective 1. Determine the quality and quantity of physical habitat for salmonids in selected streams in the Umatilla River Basin.

Objective 2. Estimate standing crop, densities and species composition of juvenile salmonids in streams surveyed for habitat, and estimate relative abundance and species composition at 40 permanent index sites in the Umatilla River Basin.

Objective 3. Estimate emigration timing and abundance of juvenile anadromous salmonids.

Objective 4. Determine age and growth characteristics of salmonids in the Umatilla River Basin.

Objective 5. Determine natural spawning success, spawning habitat utilization, pre-spawning mortality, and number of redds per adult spring chinook salmon passed above TMD. Determine, if possible, spawning distribution and timing of steelhead, fall chinook salmon and coho salmon.

Objective 6. Utilize radio telemetry to evaluate the passage of adult salmonids past the major irrigation diversion dams and associated passage facilities on the lower Umatilla River.

Objective 7. Utilize radio telemetry to evaluate the movements of adult spring chinook salmon and summer steelhead trapped at TMD and transported upstream.

Objective 8. Evaluate factors that influence homing and straying of returning adult salmonids into or out of the Umatilla River Basin.

Objective 9. Estimate Tribal harvest of adult salmon and steelhead returning to the Umatilla River Basin.

DESCRIPTION OF PROJECT AREA

Summer steelhead, chinook and coho salmon were abundant in the Umatilla River prior to the 1900's. Irrigation and agricultural development throughout the basin in the early 1900's was believed to be the primary cause of the decline of steelhead and the extinction of salmon (Bureau of Reclamation 1988). Since 1855, aquatic and riparian habitats have been degraded through irrigation diversions, water extractions, channelization, livestock grazing, logging as well as agriculture and urban development (Nielson 1950, NPPC 1987).

The Umatilla River Basin in Northeast Oregon comprised 1,465,600 acres of the 6,400,000 acres of ceded CTUIR land. The Umatilla River originates on the west slope of the Blue Mountains, east of Pendleton, and flows 115 miles in a northwesterly direction to the Columbia River at RM 289 (Figure A-l). The Umatilla River Basin, hydrologic unit number 17070103 (USGS 1989), has a drainage area of 2,290 square miles. The mouth of the Umatilla River at Umatilla, Oregon, is at approximately 270 feet elevation (above mean sea level). The headwaters are as high as 4,950 feet. Mean annual precipitation ranges from ten inches/year at Umatilla to 50 inches/year in the headwaters (Taylor 1993).

The basin can be roughly divided into two physiographic regions. The lower river, west of Pendleton, has cut a low valley into a broad upland plain called the Deschutes-Umatilla Plateau. Parent geologic materials of the plain are dominated by multiple layers of middle Miocene basalt flows, specifically, the Wanapum and Grand Ronde Basalts, originating 14 to 17 million years ago. Basalt bedrock outcroppings are common in the river channel and act as hydraulic controls that delay the deepening of the river channel and valley floor. On top of the Miocene basalts were Pleistocene and Holocene loess, alluvial and glaciofluvial deposits (NPPC 1990, Walker and MacLeod 1991). Currently, vegetation on the broad Deschutes-Umatilla Plateau includes dryland crops and sagebrush-grass communities.

Historically, deciduous trees were abundant in riparian areas on the valley floor; however, land-use practices during the last hundred years have cleared most of these areas for irrigated agricultural and urban uses. Approximately 70 percent of riparian areas in the Umatilla River Basin were reported to be in need of improvement (ODFW 1987). Much of the Umatilla River from the Highway 11 bridge in Pendleton (RM 55.4) down stream to Echo (RM 26.3) has been channelized and straightened. As a result there are few meanders, lateral scour pools or oxbows.

The region east of Pendleton was dominated by foot hills and the Blue Mountains. The Blue Mountains were created by lifting, faulting and folding of volcanic, sedimentary and metamorphic rock. The middle Miocene basalts of the lower river were also the dominant parent materials in the headwaters. The river and streams have cut steep sided canyons into the layers of rock that form the higher elevations of the Blue Mountains. Exposed basalt fractured into blocks and plates while unexposed layers remained fairly

impervious to water (Walker and MacLeod 1991). The combination of steep canyon walls and impervious bedrock leads to poor ground water recharge (NPPC 1990). U.S. Geological Survey (USGS) flow data from 1904 through 1996 show stream hydrographs that reflect the various features of the basin as described above. High flows regularly occur during rain storms and snow melt conditions. Extreme low flows were common during summer and dry conditions. This effect is less pronounced in the near pristine North Fork Umatilla Wilderness Area and the North Fork of Meacham Creek, apparently because of the lack of human disturbance, higher elevation of the headwaters, developed soils, large woody debris and climax plant communities. Vegetation distribution patterns upstream from Pendleton are typical for the Blue Mountains. Grasses and small shrubs dominated the drier, south facing slopes. Conifers dominated the north facing slopes, higher elevations and moderately wet areas.

MATERIALS AND METHODS

OBJECTIVE 1: Habitat Surveys

Task 1.1: Determine the quality and quantity of physical habitat for salmonids in selected streams in the Umatilla River Basin.

Methods developed by ODFW (Moore et al. 1993) were used to inventory stream habitat. Habitat surveys were conducted during the summer low-flow period. Two people worked upstream dividing the valley into large-scale reaches and the stream into individual habitat units. Reach classifications were made when major changes occurred in valley form, riparian composition or land use. A reach change could also be designated at fish passage barriers or when tributaries contributed a significant portion of flow to the stream being surveyed. At the beginning of a reach, we recorded specifics about valley form, land form, channel form, terrestrial vegetation, land use, water temperature, flow (high, medium or low) and valley floor width (VWI). VWI was the ratio of active channel width to valley floor width. General notes, photographs and a photo-log were taken throughout the survey to document landmarks, habitat problems, passage concerns, irrigation diversions, tributaries and surface springs. The locations of landmarks such as bridges or tributaries were marked with a unit number on a photocopy of a 7.5' topographic map. An Oregon Water Resources map of the Umatilla River Drainage Basin was used to approximate river miles.

Stream habitat units were classified with more detail than the reaches. A habitat unit was a section of stream that had distinct hydraulic characteristics from adjacent stream sections (except dry channel classifications). Each unit was numbered sequentially and identified specifically as riffles with pockets, lateral scour pool etc.

The following data was recorded at each habitat unit: estimated mean length, width and depth (maximum depth for slow water units and mean depth for fast water units), slope, aspect, shade, substrate composition, boulder count, wood rating (based on benefit to fish), bank stability, bank composition, percent undercut bank, percent flow in channel(s) and channel type. The primary channel measurements were kept separate from secondary channel measurements.

At every tenth unit the following data were also recorded: measured unit length and width, active channel height and width, VWI, terrace characteristics. Estimated dimensions were adjusted based on a conversion factor derived from comparisons of estimated and verified lengths and widths. At the start of every tenth unit, the unit number, type and length was written on orange flagging and attached to a tree limb or other suitable object.

Riparian communities were inventoried every 30 units and at the beginning of each reach. Halfway between the upper and lower boundaries of a habitat unit, a measuring tape was extended 30 m into the riparian zone (perpendicular to the stream and from the margin of the active channel). Three lateral transects, each measuring 10 x 5 m, were inventoried on each side of the stream. Within each of the six transects the following data was recorded: geomorphic surface features; ground slope; canopy closure; percent shrub and grass cover; tree groups (conifer or hardwood); tree count by breast height diameter

(DBH) class, and pertinent notes. In each riparian transect, crews recorded land use, roads, secondary stream channels, exposed soil and rock,

Woody debris were tallied and described if they met minimum length (3 m) and diameter (15 cm) requirements. Root wads were tallied if they met the minimum diameter requirement (1.5 cm). Crews recorded woody debris type (conifer or hardwood), length class, diameter, configuration and location in the channel.

Crews measured water temperatures of springs and tributaries as well as the river immediately upstream. Staff also estimated the percentage of mainstem flow contributed by each spring and tributary.

Task 1.2: Monitor stream temperatures in the Umatilla Basin and examine stream flow and flow records.

Temperatures

CTUIR, ODFW, U.S. Forest Service (USFS) and U.S. Bureau of Reclamation (BOR) coordinated the deployment of 32 thermographs and four HYDROMET stations in the Umatilla River Basin to maximize consistency and coverage without duplicating effort. Specifics regarding the location and deployment of thermographs are summarized in Tables C-l through C-5. CTUIR thermographs were initialized, downloaded and deployed in the field with the use of a portable computer. New batteries were installed and the seals and clamps were cleaned, inspected and changed as needed. Thermographs were sealed inside a waterproof housing and placed inside a small steel cage. Steel chains or cables anchored the units to large trees or boulders. Thermographs and cables were concealed to minimize tampering. Photographs were taken and detailed descriptions of the location of each thermograph were written at the time of deployment. Detailed vicinity maps were drawn and 7.5 minute topographic maps were marked.

Flow

Stream flows in the basin during the winter of 1995-96 were examined and compared to flows from previous years. The relationships between extreme high flows during the winter and juvenile salmonid densities during the following summer were examined. The relationship between spring flow and returning adult steelhead two years later was also examined.

OBJECTIVE 2: Biological Surveys

Task 2.1: Electrofish and estimate salmonid densities in streams surveyed for habitat.

Backpack electroshockers were used to sample fish from river sections recently inventoried for habitat. Crews began electrotishing within several weeks of habitat surveys to record relationships between habitat conditions and salmonid abundance. The units sampled for fish were selected in the field because some units could not be sampled due to excessive depth, width, in-stream cover or absence of water. Selective bias was minimized by stratifying the samples throughout the reach. A variety of units with different physical characteristics (i.e. braided and single channels, shaded or unshaded, cover or lack of cover) were sampled to represent the habitat complexity within and between unit types. Care was taken to avoid startling fish from a unit before and during sampling. Block nets were not used as in past years because of the size the stream and the low salmonid densities.

Salmonids were captured with dip nets and removed during two successive electrofishing passes. Crews maintained a depletion rate of at least 50% between passes. The same individual electrofished in a similar manner for at least the same number of seconds as the previous pass. Electroshocker settings (i.e. volts, pulse) remained'constant for each pass. A second pass was not conducted if salmonids were neither captured nor observed during the first pass.

Captured salmonids were placed in a livewell until the completion of both passes. Fish were identified to species, measured (fork length, mm) and inspected for fin clips, brands or marks. Water temperature was recorded. Injuries or signs of disease or stress were noted. Bird bites were described as either puncture or scissor wounds.

Juvenile spring chinook salmon were not differentiated from juvenile fall chinook salmon nor were steelhead differentiated from resident rainbow trout. After examination, salmonids were released where captured or into a nearby area if conditions were significantly better.

Approximately 6-12 scales were removed from captured salmonids on area two rows above the lateral line, posterior to the dorsal tin, and anterior to the adipose fin. Scales were placed in clear mylar envelopes labeled with the stream, unit number, date, species and fork length.

Captured northern squawfish were sacrificed. Stomach contents were sampled to determine predation on juvenile salmonids. Scale samples were taken from a portion of the catch. Numeric estimates of all other non-salmonids observed during the first pass were recorded.

Estimates of salmonid abundance were calculated with a maximum-likelihood model (Van Deventer and Platts 1989) from the number of salmonids captured during successive electrofishing removal passes. Densities were estimated by dividing estimated salmonid abundance with estimated wetted channel area (estimated from habitat data). Low sample sixes required us to pool salmonids to generate abundance estimates. Estimates for each species were calculated by multiplying the percent species composition by the general estimate. Mean density for a specific habitat type was calculated by dividing the sum of population estimates for each unit type by the area electrofished. The population estimates for each habitat type were added to estimate the total population of the stream. Salmonid densities were also estimated for slow and fast water units. Densities for whitefish and squawfish were estimated only for habitat where they were captured from actual catch rather than from expanded abundance estimates. Densities of other non-salmonids were based on the number observed (not captured) divided by area. Abundance estimates of non-salmonids were calculated by multiplying the total wetted habitat area by the estimated density.

Task 2.2: Electrofish permanent index sites during November, April and August.

We electrofished 40 permanent index sites located throughout the Umatilla River Basin to monitor salmonid relative abundance, seasonal distribution and habitat utilization (Figure A-2). Stable sites were chosen to monitor salmonid populations over time rather than the populations response to changes in habitat. Each site was surveyed using the methodology described in task 1.1.

A typical index site consisted of fast and slow water habitat types. A few sites had more than two habitat types. Meacham Creek (site 30) was the only site with only one habitat type. The lower and upper boundary of each site was marked in the field with numbered tags. Most tags were placed on l^DDing trees or on wooden posts outside of the active channel to avoid tag loss during high flows. Site measurements, photographs and a detailed description of tag and site location were taken to expedite locating the site. Each index site location was also marked on an Oregon Water Resources map of the Umatilla River Basin.

Index sites were sampled during March, August and November. Sampling time varied depending on environmental conditions. Floods, cold weather, de-watering and inaccessibility occasionally delayed or prevented the sampling of some sites. The length and width of each habitat unit was measured at each index site as well as the mean depth in fast water units and maximum depth in slow water units. The habitat was measured to monitor physical changes which may affect catchability, abundance and species composition. Crews took photographs and recorded water and air temperatures, weather, stream flow (low, medium or high), water clarity, visibility, and electrofishing effort and settings (voltage, pulse).

Index sites were electrofished upstream (single pass) without blocknets. One person operated a backpack electroshocker with a netted electrode while a second person captured fish with a dip-net. Methods for collecting fish data were consistent with the methods described above. Salmonid catch rate (s/min.) was calculated for each index site. Except northern squawfish, non-salmonids were counted but not captured.

During April and May, 1996, 48 relative abundance sites were sampled in conjunction with index site monitoring. Two additional sites were examined in August and September, 1996. We sampled small tributaries to determine the distribution and relative abundance of salmonids in these systems during the spring. One intermittent electrofishing pass was made up through a section of stream. Efforts were concentrated in areas where the probability of capturing salmonids appeared highest. Catch data, area sampled and seconds of electrofishing were recorded. Crews made detailed site descriptions, marked the locations on a map, and photographed the site.

OBJECTIVE 3: Smolt Trapping

Task 3.1: Install and operate rotary screw traps.

We employed two rotary screw traps five feet in diameter to capture emigrating juvenile salmonids (E.G. Solutions, Inc. design). The first trap was installed near the Imeques C-mem-ini-kern site (RM 79.5) where it operated 159 out of 256 days from September 7, 1995 to June 9, 1995. The second trap was installed in the Umatilla River on October 10, 1995 near Bamhart (RM 42.6) and operated 41 of 44 days through November 22, 1996. In November, the trap near Barnhart was severely damaged during a flood. After repairs, it was installed on Meacham Creek and operated 24 out of 29 days from May 8, to June 6, 1996.

The following data were recorded daily while trapping: trap site, date, time, number and species of fish captured, lengths, marks, clips, number of fish marked and released and comments regarding weather, stream flows and trap effectiveness. Non-salmonid species were counted. We estimated dace and shiners when large numbers were captured.

Trapping efficiency was estimated by marking salmonids with one of 12 temporary marks. Fish were marked by clipping a notch in the margins of the caudal fin, anal fin, dorsal fin or a combination of the above. Marked salmonids were released approximately 100 to 1,000 m above the rotary traps during the day. During high flows fish were released farther upstream than during low flows. Recaptured salmonids were counted, measured and released below the trap. Additional marked juvenile salmonids were placed in the livewell for 24 hours to determine containment rates. Minimizing escapement from the livewell through containment monitoring (and repair when necessary) increased effective catch rates. Depending on availability, we used one to 100 fish of a given species and size class for mark-recapture and containment trials.

Trap efficiency estimates and total migrants at the Imeques trap site were calculated by averaging weighted, multiple, running means from catch, mark and recapture trials of three to 13 days. Migrant estimates for the Meacham and Barnhart traps were calculated by dividing the total catch by the average catch rate. No estimates were made for outmigrants when the traps were not running due to floods, ice, heavy debris or repair.

Assumptions used to estimate trap catch rates and the number of salmonids migrating past the traps include: 1) marked and unmarked salmonids were actively migrating past the trap; 2) fish downstream of the trap did not return to risk capture again; 3) previously captured, handled and marked fish released upstream of the trap had an equal probability of capture as naive unmarked fish; 4) recaptured fish escaped from the livewell at the same rate as naive fish; 5) marks on recaptured fish were correctly recognized and recorded by samplers, and 6) no mortality of marked fish occurred between the release site and the trap.

We also estimated total outmigration of natural juvenile chinook and steelhead with the following formula (adapted from Everhart et al. 1975):

$$\left[\frac{MC}{R}\right](MR)(BRR)$$

Where

M =	Number of branded individuals released at upper traps.
c =	Total number of branded and unbranded individuals captured at lower traps.
R =	Number of branded individuals recaptured at lower traps.
MR =	The migration ratio of branded individuals (one minus the residualism rate).
BRR =	Mean brand retention rate.

We assumed that branded fish were subject to the same mortality factors as unbranded fish and that branded fish released into the river had the same brand retention rate as those held for observation at Minthom Springs. We assumed that all quality brands and 67% of poor brands would be detected during examination. We estimated that 84% of the steelhead branded, remained in the system for an additional summer based on sixes and ages of fish captured at the upriver traps in comparison to those examined at TMD.

Task 3.2: Freeze brand juvenile salmonids for interrogation in the lower Umatilla and Columbia Rivers.

Juvenile salmon and steelhead captured at the rotary traps were branded with tools super cooled with liquid nitrogen after methods similar to those reported by Knight (1990). Brand codes were 7T, 7U, 7N, 7F, 7K, and 7S in both 1/4" and 3/16", depending of fish size. Salmonids were branded either on the left or right sides in either the anterior or dorsal locations. Different combinations of brands, location and rotation were used to differentiate between the time and location where fish were trapped. Fish were branded from October 6, 1995 to May 26, 1996 according to the schedule listed in Table E-3. ODFW personnel examined and recorded information on branded juvenile salmonids captured in their traps near TMD.

To evaluate brand retention, 382 branded chinook and 374 branded steelhead were taken from the Imeques and Meacham trap sites and hauled to Minthom Springs and held for 27 to 32 weeks in four mesh covered tanks (1x1.5x1.4 m, with 55 l/min flow). Fish were fed Oregon Moist pellets. Brands were examined monthly and rated for readability. Brands rated "good" included all readable brands ranging from fair to excellent. Brands rated "poor" included all brands that were read with difficulty. Brands rated "unreadable" included all partial brands or brands too faint to determine the code or rotation. Brands, other marks, species and fish length were recorded as part of a larger mark retention evaluation project (ODFW, unpublished data).

OBJECTIVE 4: Age and Growth

Tasks 4.1: Age analysis of adult and juvenile salmonids.

From adult salmonid carcasses, we sampled approximately five scales from the preferred area, two rows above the lateral line on the left side of the fish in a diagonal line between the posterior edge of the dorsal fin and the anterior edge of the anal fin. Because of the high incidence of regenerated scales, additional scales were taken two rows below the lateral line and from the other side of the fish in the same area. Adult scales were mounted on gum cards and pressed in cellulose acetate. Adult fish sampled were measured mid-eye to hypural plate (MEHP length), and fork length if erosion of the caudal fin was minimal.

Approximately ten scales were collected from juvenile salmonids sampled during electrofishing. Scales were placed between the fold of a mylar strip. Species, fork length, date, and area captured were written on the left hand edge of the mylar strips with permanent marker. Scales in the mylar strips were read in a microfiche reader without additional handling.

Adult and juvenile scales were analyzed under a microfiche reader at magnifications of 42x and/or 72x. We used the European method of age designation. For example, 2.1 designates a steelhead that spent two winters in fresh water and one in the ocean and returned to freshwater to spawn in the spring at age 4. All questionable scales were reviewed by two readers and differences in interpretations were discussed. The scale was eliminated from the sample pool if interpreters did not concur.

OBJECTIVE 5: Spawning Surveys

Task 5.1: Determine, for spring chinook salmon, the final disposition of adults enumerated at TMD.

Records from mainstem trapping, upstream transport, harvest monitoring and hatchery spawning were reviewed to determine the disposition of adult salmonids enumerated at TMD.

Tasks 5.2: Conduct pre-spawning, spawning, and post-spawning surveys throughout the basin for spring chinook salmon. Conduct limited spawning surveys to determine general distribution and timing for summer steelhead, fall chinook salmon and coho salmon as conditions allow.

We conducted spawning ground surveys to enumerate summer steelhead, spring and fall chinook and coho salmon redds and sample mortalities in various reaches of the Umatilla River Basin. Repeated surveys were conducted in areas important for spawning or holding. Other areas were surveyed fewer times or not at all because of poor survey conditions or low fish abundance observed during previous years. Surveyors wore polarized glasses to maximize fish observation. To minimize stress on pre-spawning adults, crews did not probe debris jams or throw rocks into pools. Most surveys were conducted by two people, with additional surveyors paired with the more experienced surveyors during the peak of the post-spawning mortality. Three to four river miles were generally surveyed daily by each person, walking either along the margins of the smaller lateral tributaries or back and forth from bank to bank in the larger systems.

Redds were judged to be complete (and thus spawning successful) based on size, depth, location of the redd as well as and size of gravel and cobble excavated. All redds were reviewed by our most experienced surveyors for consistency. Orange flagging was placed in trees or other structures as close to the redd as possible and at least five feet off the ground to minimize disturbance by wildlife and livestock. The date, location, species and number of males and females observed on or near the redd were written with permanent marker on the flagging. Writing on the flagging was at least three inches above the lower end of the flag to avoid loss due to wind whip. In a data book, crews also recorded information about redds, carcasses and live fish. They included the number and sex of fish observed holding in pools or on or near redds, carcass MEHP lengths, injuries and the apparent cause of death of pre-spawners, and habitat types where live fish and redds were observed. Fork lengths were also measured if severe caudal fin erosion had not occurred. Salmon and steelhead carcasses were cut open to determine the egg retention of females and spawning success of the males. We defined pre-spawning mortality as death before any spawning had occurred. We classified carcasses as pre-spawning mortalities only for females with intact skeins and 100% egg retention and for males with full, corpulent, gonads. Tails of sampled fish were removed at the caudal peduncle to prevent re-sampling. Snouts were removed behind the orbit to recover CWTs from steelhead with both adipose and left ventral (pelvic) fin clips, and salmon with adipose fin clips (including combinations of adipose and other fin clips). Snouts were placed in plastic bags and given an individual snout number for identification. Snouts and accompanying data were sent to ODFW's Mark Process Center in Clakamas, Oregon, for CWT extraction and reading. Kidney samples were collected from CWT spring chinook carcasses that appeared to have been dead for less than 48 hours. Kidney samples were held on ice during the day of collection, frozen and sent to the ODFW pathology laboratory in La Grande for analysis.

OBJECTIVES 6 and 7: Adult Passage Evaluations

Tasks 6.1 and 7.1: Evaluate the upstream migration of radio-tagged adult salmon and summer steelhead past the irrigation diversions in the lower Umatilla River, and evaluate movements of radio-tagged adult spring chinook salmon and summer steelhead following upstream transport.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) initiated a radio telemetry study in 1992 to evaluate adult salmonid passage in the lower Umatilla River. Fixed-site receivers were installed at key locations on the Umatilla River and mobile tracking efforts were incorporated in tributary streams. The primary objectives of this project were: (1) evaluate adult passage past five major diversion dams on the lower Umatilla River, (2) evaluate movements of spring chinook salmon and summer steelhead following upstream transport (trap and haul), and (3) evaluate migration timing and flows necessary for salmonid homing to the Umatilla River.

Radio telemetry work on the Umatilla River encompassed the entire Umatilla River and tributaries upstream of TMD. Primary emphasis was given to five major irrigation diversion dams. These include Maxwell Dam (RM) 15.2), Dillon Dam (RM 24.6), Westland Dam (RM 27.2), Feed Canal Dam (RM 28.2), and Stanfield Dam (RM 32.4; Figure A-l).

This project involved two separate evaluations of adult salmonid movements. Task 6.1 (passage evaluation) evaluated migration of adult summer steelhead, coho, and spring and fall chinook salmon from TMD to above Stanfield Dam. Task 7.1 (upstream transport evaluation) evaluated the movements of summer steelhead and spring chinook salmon following upstream transport (trap and haul) and release.

Fish utilized for the radio telemetry project were captured in the TMD adult trapping facility (east-side) and anesthetized with carbon-dioxide. Radio transmitters were inserted into the stomach. After tagging, individually tagged fish were either released directly above TMD (Task 6.1) or placed in a truck for transport upstream (Task 7.1). Transported fish were released at either Nolin (RM 33.6), Barnhart (RM 42.2), Thomhollow (RM 73.5), or Imeques-C-mem-ini-kern (Fred Grays, RM 80).

Fish were radio-tagged at various times depending on numbers returning to TMD. An attempt was made to radio-tag a representative sample throughout the adult return at low, medium and high river flows. Coded transmitters obtained for the study were purchased from Lotek Engineering in Newmarket, Ontario, Canada. Radio transmitters were high frequency 150 MHz and varied in size depending on the species being tagged. Summer steelhead and coho salmon received transmitters measuring 4.5 cm long and 1.7 cm in diameter. Fall and spring chinook salmon transmitters were 8.2 cm long and 1.7 cm in diameter. All radio transmitters had a minimum operating life of approximately 250 days.

Movements of radio-tagged fish were monitored with Lotek SRX 400 radio telemetry receivers. Both mobile and fixed-site tracking efforts were employed during the study. Fixed-site receivers (with memory capabilities) were installed at Westland, Feed Canal, and Stanfield dams. One additional receiver was installed near the ODFW office in Pendleton (RM 56). Each fixed-site receiver(at diversion dams) included two antennas; one underwater antenna in the fish ladder, and one three-element yagi antenna. Receivers were programmed to alternately scan each antenna for six seconds. This arrangement allowed the determination of migrational route (fish ladder or over the dam crest) and arrival and departure times of individual fish at each diversion dam. Passage times at diversion dams for individual fish were calculated by comparing arrival and departure times. Passage duration through all the diversion areas were found by comparing the release time at TMD to the last recorded time above Stanfield Dam (the uppermost diversion).

Most mobile radio-tracking was conducted in a vehicle equipped with a four-element antenna. On occasion, portions of the system were walked with a receiver and hand-held three-element antenna. The locations of radio-tagged fish were recorded to the nearest tenth of a river mile.

Movements of radio-tagged summer steelhead and spring chinook salmon in relationship to water temperatures and river flows were included in the study. Data was provided by Zimmerman and Duke (1994, 1995 and 1996).

OBJECTIVE 8: Homing and Straying of Adult Sahnonids

Task 8.1: Determine factors essential for homing and upstream migration of maturing salmonids.

Data on returning adult coho, fall and spring chinook salmon, and summer steelhead was analyzed in an attempt to understand conditions necessary for successful homing to the Umatilla River. All information about Umatilla River adult returns was considered in the search. This included juvenile release data, CWT recoveries (Rowan 1996), radio telemetry data, and water flow and temperature data obtained from Zimmerman and Duke (1996).

OBJECTIVE 9: Tribal Harvest

Tasks 9.1: Design and implement creel and phone surveys to estimate tribal harvest of adult anadromous salmonids.

Fisheries personnel monitored the tribal harvest of adult steelhead and spring chinook salmon from the Umatilla River. Steelhead harvest was monitored from December, 1995 through March 31, 1996. Tribal spring chinook salmon season was divided into two gear types during a discontinuous season between May 31 and June 30, 1996. Hook and line season was opened from May 31, to June 16 and the weekends of June 21-23 and June 29 and 30. A season allowing all types of subsistence gear also occurred during the weekends of June 8-9, 15-16, 21-23, and 29-30. A roving creel survey was incorporated for harvest monitoring. Survey design followed the work of Malvestuto et al. (1978) and Malvestuto (1983). Surveyors recorded the time, location and number of anglers, and the number of fish caught. In addition, we conducted a selective phone survey with tribal anglers after both seasons.

RESULTS AND DISCUSSION

OBJECTIVE 1: Habitat Surveys

Task 1.1: Habitat surveys.

Habitat surveys were conducted from the mouth of the Umatilla River (76 m, 250 feet elevation) to the west boundary of the Umatilla Indian Reservation boundary near the Highway 11 bridge (RM 56.1; 335 m 1,100 feet) from June 4 to August 1, 1996. A total of 1832 habitat units (1,657,577 m^2) were classified and inventoried (Tables B-l through B-4). We divided the river into the following three reaches: mouth to Westland Dam (RM O-27.3); Westland Dam to McKay Creek confluence (RM 27.3-50.6), and McKay Creek to Highway 11 Bridge (RM 56.1). The first reach consisted of lower gradient 0.001% areas mixed with 3.8 km of high gradient sections (0.1%; USGS topographic data). July and August flows were low (2-87 cfs at the Umatilla gage, 3-8 cfs at the Dillon gage) in the first reach because water was diverted at Westland Dam. In reach two, water released from McKay reservoir elevated flows from about 45 to 250-325 cfs (Yoakum gage), increased turbidity and decreased water temperatures (Zimmerman and Duke 1996). Gradient in reach two was more consistent (0.002%), and the increased flows provided abundant fast water habitat types. The predominant features in the third reach were low flows ($\sim$ 35-107 cfs, Pendleton gage), moderate gradient (0.004%), and horizontal layers of bedrock making most of the wetted channel wide and shallow.

High water temperature appeared to be the primary factor limiting salmonid distribution and abundance. Recorded water temperatures ranged from 9°C (48°F) at RM 46.3 (August 22, 8:00 am), to

30°C (86°F) downstream from an irrigation waste-water return at RM 25.3 (July 16, 2:00 pm). Water temperatures were often above the salmonid lethal limits (24-25°C) reported by Black (1953) and Brett (1952).

Spring-fed areas in the second reach provided some suitable habitat. A total of 78 surface springs were identified, averaging 1.4 per RM. Most springs were too small to provide off channel rearing for salmonids but did contribute cool water to the mainstem.

Water released from McKay Reservoir for irrigation provided the majority of flow to the Umatilla River in reach two. The cooler waters released from the reservoir's hypolimnion, often kept water temperatures suitable for salmonids (Figure C-2). However, waters released from McKay Reservoir are not continuous during the summer and water temperatures can become extreme when releases are stopped. In addition, warmer epilimnetic waters can be discharged after cooler hypolimnetic waters are depleted. During drought years, McKay Reservoir has less water for summer releases. The system creates a reach that provides salmonid habitat during all but a few weeks each year depending on climate and operation of McKay Dam. Some water stored in McKay Reservoir was allocated for fisheries resources, but this has been needed to assist adult salmon with homing and upstream migration during the spring and fall.

Slow water habitat in all three reaches comprised 75.3 % of the area. Glides comprised the most slow water habitat followed by lateral scour pools, straight scour pools, and dammed pools. The average maximum depth of slow water habitat was 0.95 m. Fast water habitat accounted for 24.7% of the wetted area surveyed. Riffles comprised the most fast water habitat followed by riffles with pockets, and rapids over bedrock. The average depth of fast water habitat was 0.29 m while the average depth of all units was 0.72 m. Dry channel accounted for 0.1% of the area surveyed. Thirty-one steps (small water falls) comprised 0.1% of the area (Table B-l).

Secondary (braided) channels accounted for 23.2% of the channel length and 8.5 % of the area surveyed. The average width of the active channel was 3.0 times that of the wetted channel. The average width to depth ratio of the wetted channel for all unit-types was 19: 1. The width to depth ratio for riffles was 61: 1. Seven percent of the streambank length was classified as undercut, and 26.6 % was eroded (Table B-2).

Gravel (2-64 mm) was the most abundant substrate (44% of the total area; Table B-3), with 724,054 m^2 of streambed area. Fine substrate comprised 20% of the streambed area. Riparian ground cover was 23% shrubs, 51% grasses, and 26% exposed soil or rock. In riparian transects, low terraces were dominant, high terraces secondary and hillslopes tertiary. Eroded banks frequently functioned as high constraining terraces.

Hardwoods were the dominant tree species in riparian transects (83.9. %), but tree densities averaged only 2.6 trees/100 m^2. Most trees (76.6%) were smaller than 30 cm DBH. The removal of trees for agriculture and residential development limited canopy shading. Shading decreased as distance from the channel increased (range 15-32%). The percent open sky averaged 77 %.

The riparian canopy along many reaches in the Umatilla River was insufficient and provided little shade to the stream. Direct solar radiation and total water volume play the greatest roles in stream temperature dynamics (Brown 1983). During an experiment large trees were removed from along a stream and adjacent areas (Brown and Krygier 1970). Maximum stream temperatures increased from 15.6°C (60°F) before vegetation removal to 30°C (86°F) after removal. Control reaches had no significant changes during the same time period (Brown and Krygier 1970). During the summer and fall, shallow, unshaded pools, riffles and glides are typical to much of the Umatilla River. These areas function as solar energy collectors and water temperatures can become warmer than the upper tolerance limits for salmon and rainbow trout reported by Brett (1952) and Black (1953). Large woody debris averaged 3.6 pieces per 100 m^2 and were located primarily outside of the wetted channel (Table B-4).

Consistent with earlier surveys conducted by Nielson (1950), the lower Umatilla River has been highly altered by human development. Stream channel morphology and flows have been significantly altered by irrigation dams and pumps, channelization, and the development of farms, homes and industry in the riparian area and adjacent uplands.

Modern human activities increased water temperatures loaded the river with agricultural fertilizers, sewage, pesticides, suspended sediments as well as urban and industrial pollution (Oregon Department of Environmental Quality, personal communication). Scrap metal, tires, automobile batteries and chemical containers were observed in the active and wetted channel. Algae was noted throughout the area, and sewage was observed in the pool behind TMD.

Sixty-two surface water diversions (gravity and pump) and numerous wells were observed from RM O-56.1. CTUIR observed 83 diversions (including pumps) from the mouth of the Umatilla River to RM 89.6 at the confluence of the North Fork. This contrasts to the 17 diversions observed by Nielson (1945) fifty years earlier. Nielson concluded in 1945 that the 17 diversions were the primary factors in the extinction of the formerly abundant salmon and the decline of steelhead runs.

The application of herbicides and insecticides threatens rearing and migrating salmonids and the ecosystems that support them. The herbicide Magnacide-H, commonly known as Acrolean, was used by Hermiston Irrigation District in their canals and ditches. Acrolean is acutely toxic to fish and wildlife in small doses, and had the potential to enter the river through infiltration and wasteway return flows. Aerial spraying of agricultural pesticides adjacent to the river was frequently observed by the habitat crews. Furthermore, Umatilla County Vector Control applied "Golden Bear 1 1 1 1 ", a petroleum distillate toxic to fish, to control mosquitos in isolated pools.

Task 1.2: Monitor stream temperatures in the Umatilla Basin and examine stream flow and flow records.

Temperatures

Selected stream temperature profiles collected throughout the Umatilla River Basin were plotted in Appendix C (Figures C-l through C-17). Water temperatures became less than ideal (above 20°C, 68°F) for salmonids during the summer below RM 70 in the Umatilla River and in the lower ends of many of the tributaries. For example, in the Umatilla River at RM 42.5, waters temperatures were well above 20°C (Figures C-l and C-2). In Wildhorse Creek at RM 9.5, water temperatures were above 25°C (77°F) in July and August (Figures C-13 and C-14). Higher in the basin, temperatures were suitable for salmonids throughout the year. In Mission Creek, at RM 3, water temperatures did not exceed 17°C (63°F) during July and August 1996 (Figure C-4).

Flow

Rain on snow events during the winter of 1995-96 caused floods which disturbed redds and displaced juvenile salmonids. During the floods, high water increased the channel width, removed riparian vegetation, scoured out new channels and pools, and deposited substantial gravel and cobble alluvium in many areas. During the subsequent summer and fall, extreme low flows through wide, exposed, stream channels lead to higher water temperatures than occurred in previous years. In Meacham Creek at RM 5.2 maximum daily water temperatures (June through September) averaged 1.2°C (2.4°F) warmer in 1996 than in 1993. Minimum daily water temperatures averaged 1.7°C (3.0°F) warmer. Generally during years of increased flow, stream temperatures are lower. However, water temperatures were higher in 1996 (flows were 145% of normal) than in 1993 (flows were 115% of normal; Figure C-18).

Flooding appears to have decreased salmonid abundance as trap catch rates for fry, parr and smolts were lower than previous years. Lower salmonid densities were also observed at many index sites. While salmonid survival is unknown, many of the eggs and fry were probably lost. Major floods and scouring occurred when eggs from spring chinook, fall chinook, coho salmon and steelhead were incubating. Flows peaked near the end of November 1995, early in February and late in April 1996 (Figure C-18).

Survival of the older parr and smolts may have been either reduced or enhanced. The strength of the adult steelhead returns in 1998 will indicate what benefit or detriment the floods may have had on the survival of older steelhead outmigrants. Flushing flows have correlated well to increased adult returns in the past (Figures C-19 and C-20). However, the floods of 1996 may have been too severe to provide an overall benefit for outmigrants.

OBJECTIVE 2: Biological Surveys

Task 2.1: Electrofish and estimate salmonid densities in streams where habitat has been surveyed.

Crews electrofished 263 habitat units (14.4% by units and 4.6% by area) in the Umatilla River from the mouth to RM 56.1 between June 11 and August 30, 1996. Ten different habitat types were sub-sampled (Table D-l). Only 160 naturally produced salmonids were captured between RM 1.5-52.4. The majority (141, 87%) were juvenile steelhead (Table D-2). Most salmonids (65%) were captured from reach 2, and appeared to be in excellent condition. All whitefish were captured from RM 46.3-50.0. Most whitefish (77%) were captured in fast water habitat where mean density was 7.5 times higher than slow water habitat. No salmonids were captured or observed from RM 0.0-l .5, and RM 52.5-56.1.

The population estimate for the river section was 2,455 naturally produced salmonids with a mean density of 0.148 salmonids/100 (s/100 m^2). Fast water habitats had a mean density of salmonids 4.5 times higher than in slow water habitats (0.358 vs. 0.079 s/100 m^2). Highest salmonid mean density was in rapids over boulders (0.401 s/100 m^2). Riffles, riffles with pockets, isolated pools, and rapids over bedrock were next highest (Table D-2). Most isolated pools yielding catches had small cold spring sources.

The population estimate of non-salmonids was 1,580,000 fish. Crews visually enumerated 73,281 non-salmonids while sub-sampling 4.5 % of the habitat. Speckled dace were most abundant (34,3 18, 46 %) followed by redside shiner (24,108, 33 %), sucker (7,266, 10%), chiselmouth chub (4,820, 6.5%), northern squawfish (1,480, 2.0%), sculpin (1,202, 1.6%), carp (60), smallmouth bass (23), brown bullhead (2), adult lamprey (1), ammocoete (1), bluegill (1), and pumpkinseed (1). The estimated ratio of non-salmonids to salmonids was 455: 1 (Table D-3). All carp, bass, bluegill, and pumpkinseed were captured downstream of TMD.

Squawfish fork lengths ranged from 20-475 mm (n = 1480) and averaged 129 mm. Their stomachs contained primarily insects followed by dace. The fact that no salmonids were found in squawfish stomach contents is reasonable because of the small mean size of the squawfish captured and the low abundance of salmonids. Only 32 (2.2%) of the captured squawfish were greater than the 360 mm length that Rulifson (1984) reported as the size when most squawfish become predominantly piscivorous. Palmer et al. (1986) found the diets of squawfish > 360 mm consisted of 50-90% fish while diets of squawfish < 360 mm consisted of 6-24% fish.

Catch data and population estimates have a notable bias because of the gear and methodology used. The deeper habitat was not sampled or sampled superficially because of limitations imposed by the back-pack electrofishers.

Task 2.2: Electrofish permanent index sites during November, April and August.

November

High flows created poor sampling conditions from November 8 through 30, 1995. In most cases, sampling was restricted to the stream margin. Most salmonids were captured in slow water, with cover provided by undercut banks and woody debris. Many of the fish appeared to have been actively feeding. Several sites were not sampled in November due to flooding and include: South Fork Umatilla River (site 13); North Fork Meacham Creek (site 33); East Fork Meacham Creek (site 35), and Shirnmiehom Creek (site 40).

During November, natural steelhead were not observed below site five at RM 50 nor were natural chinook salmon collected below site 10 at RM 88. Natural coho salmon were not collected below site 7 at RM 67.7. The streams with the highest catch rates were Ryan Creek (5.1 s/min.), Bear Creek 5.0 s/min.), East Birch Creek (4.9 s/min.), and Pearson Creek (4.4 s/min.).

March and April

Field conditions were generally good for sampling at most sites from March 8, through April 11, 1996. Bear Creek (Birch Creek Drainage, site 22) was not sampled at the landowner's request. Juvenile natural steelhead were collected throughout the basin. No natural coho were collected below RM 25 nor were juvenile chinook collected below RM 88. No mountain whitefish were captured.

The highest salmonid catch rates were from Line Creek, (4.1 s/min), Umatilla River, site 10 at RM 88 (2.4 s/min), and Ryan Creek (2.4 s/mm). The lowest catch rates were from sites in the Umatilla River below RM 74, Birch Creek and tributaries, and Meacham Creek above RM 9 including the North Fork. Based on catch rates from previous years, flooding during the winter of 1995-96 appeared to decrease juvenile salmonid abundance throughout the basin.

August

Field conditions were generally good for sampling at most sites from August 2 through 16, 1996. At the landowner's request, sites 21 and 22 on Bear Creek (Birch Creek Drainage) were permanently deleted from the sampling schedule. The Thomas Creek site was dry and not sampled. At site four the isolated pool, with spring, had filled in with gravel and reduced its length from 402 to 152 m. In the Umatilla river naturally produced juvenile steelhead were not captured below RM 25. No juvenile chinook were captured below RM 81 nor were mountain whitefish captured below RM 88. No coho salmon were captured.

Sites with the highest catch rates were Boston Canyon Creek (9.8 s/min.), South Fork Umatilla River (site 14, 7.7 s/mm.), Spring Creek (7.2 s/min.), Shimmiehom Creek (7.2 s/min.), and North Fork Umatilla River (site 11, 6.9 s/min.). Low catch rates were observed in Birch Creek, lower West Birch Creek, and in the Umatilla River below RM 74.

Additional Sites

Fifty additional sites were electrofished during the spring or summer of 1996. Many of the sites were in ephemeral streams which may provide only seasonal habitat for salmonids. Other reaches contained springs and could produce significantly more salmonids if restored.

1. Jack Canyon Creek, a tributary of West Birch Creek at RM 2, was electrofished (125 seconds) on March 15, 1996, from the mouth upstream 100 m. Five dace and no salmonids were observed. Water temperature was 12°C (54°F) at 10:30 am. Grass grew in the wetted channel, and the water had a high suspended sediment load. The adjacent lands had been heavily grazed by livestock. We estimate the lower reach of this stream provided little if any seasonal habitat.

2. A tributary of Ryan Creek at RM 1.9 was sampled (65 seconds) on April 11, 1996, from the mouth upstream 50 m to a bedrock cascade (a likely passage barrier). This intermittent tributary originated on the southwestern slope of Starve to Death Ridge and entered Ryan Creek from the east. Thirteen robust natural juvenile steelhead were captured (mean length 75 mm). The habitat consisted of well shaded glides with undercut banks and some riffles. Bedrock dominated the substrate and had a minimal layer of sand, silt and algae. Water temperature was 8°C (46°F) at 12:00 pm.

3. A tributary of the Umatilla River at RM 63.8 was electrofished (300 seconds) on May 1, 1996 from the mouth upstream 550 m to the railroad bridge. Two hatchery steelhead averaging 133 mm were captured and two speckled dace were observed. The steelhead were found downstream of the Minthom Satellite Facility road culvert. The tributary and adjacent springs were in extremely poor condition and appeared to have been channelized. Cultivated fields paralleled each bank at the margin of the wetted channel and extended completely across the stream in some areas. Water temperature was 14.5°C (5 8°F) at 1:00 pm, and silt was the most abundant substrate. We estimate that the tributary and adjacent springs have moderate salmonid production potential if restored.

4. A tributary of the Umatilla River at RM 65.3 was sampled (375 seconds) on May 2, 1996, from the mouth upstream 300 m. We captured 10 natural steelhead averaging 117 mm, one natural chinook salmon (75 mm), and one squawfish. We observed 85 dace, five redside shiners, and five sculpin. Water temperature was 10.5°C (51°F) at 11:00 am. All salmonids were captured in the reach below the lowest of two-culverts (65 m from the mouth) which had springs, blackberry cover and only moderate cattle grazing. The section upstream of the second culvert (75 to 375 m above the mouth) had eroding banks, silt substrate

with little gravel. Cultivated fields encroached both banks. If restored, this tributary has potential for moderate salmonid production.

5. A tributary of the Umatilla River at RM 67.2 was electrofished (350 seconds) on May 2, 1996, from the mouth upstream 200 m. We captured 16 natural steelhead averaging 108 mm. Water temperature was 11°C (52°F) at 12:45 pm. Downstream of the culvert on Lower Cayuse Road the stream was wide, shallow and braided. Upstream from the culvert the stream had a predominantly single channel with adequate riparian and rearing habitat. Upstream from the survey reach, the riparian vegetation had been removed and the stream channel had been channelized and relocated.

6. Patawa Creek, a tributary of Tutuilla Creek which joins the Umatilla river at RM 52.2, was electrofished for 450 seconds on May 7, 1996. We electrotished a 250 m reach just upstream from the Goad Road bridge at RM 2. We observed approximately 500 suckers, 400 dace, and 200 redside shiners. Both suckers and dace exhibited spawning coloration. No salmonids were captured or observed. Water temperature was 14°C (57°F) at 1:00 pm. Habitat in this reach was predominantly low gradient glides averaging 0.50 m deep. The creek had been impacted by livestock, agricultural practices, charmelization, erosion and siltation.

7. Patawa Creek at RM 8.0 (near a southern spur off Thompson Road) was electrofished for 175 seconds from the mouth of a small tributary (entering from southeast) upstream 100 m. No fish were observed. Water temperature was 10.5°C (51°F) at 10:00 am. Terrestrial vegetation throughout the wetted channel indicated ephemeral flows. Riffles with pockets were the dominant habitat types. Many aquatic insects were observed.

8. A tributary entering Patawa Creek at RM 8 was electrofished for 120 seconds on May 7, 1996, from the mouth upstream 100 m. No fish were observed. Water temperature was 9.5°C (49°F) at 10:30 am. This ephemeral tributary had limited salmonid production potential.

9. A tributary entering Patawa Creek from the west at RM 6 was electrofished on May 7, 1996, for 150 seconds. Crews sampled 125 m of stream downstream of the Interstate 84 culvert. No fish were observed. The stream was shallow, channelized and inundated with silt.

10. We electrofished South Patawa Creek from the mouth (at RM 4.3 of Patawa Creek) upstream 100 m for 200 seconds on May 7, 1996. Approximately 150 speckled dace were observed. Water temperature was 15.5°C (60°F) at 2:00 pm. This reach flowed between 1 m high actively eroding banks adjacent to cultivated fields. The substrate was predominately silt and clay.

11. On May 8, 1996, we sampled a 125 m reach for 224 seconds just upstream from the Holmes Road culverts on South Patawa Creek at RM 3. No fish were observed. Water temperature was 8.5°C (47°F) at 8:30 am. The narrow riparian area (6 m) provided some cover, and aquatic insects were abundant. This section's potential for salmonid rearing appeared limited by water quantity. The stream had moderate amounts of fine sediment and trash from nearby communities, roads and fields.

12. South Patawa Creek at RM 3.7 was electrofished (100 seconds) on May 8, 1996. We sampled from 20 m downstream of a small private bridge upstream 100 m. Three natural steelhead averaging 235 mm were captured from one pool with undercut banks, exposed roots and a small spring. However, shallow riffles and a channelized streambed dominated most of the reach. Water temperature was 11.5°C (53°F) at 11 am. Cottonwoods in the 30-50 cm DBH class provided good shade and riparian cover. The channel appears to dry up during the summer except for a few puddled areas. Other than the cottonwood trees at the site, cultivated fields with little riparian vegetation dominated the stream banks.

13. South Coyote Creek at RM 2.5 was sampled (250 seconds) on May 8, 1996, from the bridge at Motanic Road upstream 200 m. No fish were observed. Water temperature was 16°C (61°F) at 2:00 pm. The lack of water, channelization, actively eroding banks and cultivation of the riparian area all contributed to the poor condition of this reach.

14. South Coyote Creek at RM 4 was sampled (150 m for 175 seconds) on May 8, 1996. No fish were observed. Water temperature was 16°C (61°F) at 12:00 pm. Approximately 95% of the channel length was shallow riffle habitat. The stream had been severely degraded by livestock grazing, channelization and the removal of riparian vegetation.

15. Tutuilla Creek was electrofished (650 seconds) on May 9, 1996 from the mouth upstream 180 m to a pipe crossing over the creek. One natural steelhead (165 mm) was captured, and 13 hatchery

chinook and 13 hatchery coho salmon juveniles were present. An estimated 300 chiselmouth, 250 suckers, 75 redside shiners, and 10 dace were sighted. Water temperature was 10.5°C (51°F) at 9:45 am. The average depth of the wetted channel was approximately 0.25 m. Glide habitat with undercut banks were common. A small alluvial fan of silt was present at the mouth. This section smelled of sewage and fertilizer and had a high abundance of algae.

16. Tutuilla Creek was sampled (175 seconds) on May 9, 1996, from the mouth upstream 65 m to a wooden walk bridge. An estimated 20 suckers and 15 speckled dace were observed. Water temperature was 17°C (63°F) 2:00 pm. Sand dominated the substrate of this channelized reach.

17. Tutuilla Creek at RM 0.7 was sampled for 450 seconds on May 9, 1996, from the highway 395 bridge upstream 80 m. We captured no natural salmonids but observed three juvenile hatchery chinook and 33 hatchery coho salmon. An estimated 120 chiselmouth, 60 suckers, 40 redside shiners, and 25 squawfish were observed. Water temperature was 13°C (55°F) at 12:00 pm. Habitat was predominantly glides and riffles with sand, bedrock and gravel substrates.

18. Patawa Creek was sampled (150 seconds) on May 9, 1996, beginning at the mouth and ending 35 m upstream at Tutuilla Road. We captured three juvenile hatchery chinook and one coho salmon and observed approximately 40 chiselmouth, 30 redside shiners and 10 suckers. Water temperature was 14°C (57°F) at 1:30 pm. The riparian was in good condition and provided stable, undercut, banks. The substrate appeared suitable for spawning in higher gradient areas.

19. Butter Creek was sampled (1,280 seconds) on May 13, 1996, beginning at the mouth and ending 865 m upstream. We captured 34 juvenile hatchery coho and observed about 800 redside shiners, 225 suckers, 200 squawfish, 200 speckled dace, and 100 chiselmouth. Water temperature was 17°C (63°F) at 8:45 am. This section of low gradient stream consisted mostly of glides and riffles and appeared ephemeral. The creek had been channelized and had actively eroding banks. The substrate was predominantly gravel except for the silt in the depositional area of the lower 60 m.

20. Butter Creek at RM 7.7 was electrofished (180 m, 900 seconds) on May 13, 1996 beginning 220 m downstream from the Madison Road Bridge and ending at a concrete dam 40 m below the bridge. We captured two steelhead averaging 226 mm and observed about 120 redside shiners, 70 dace and 50 suckers. Water temperature was 15°C (59°F) at 12:00 pm. The height of the dam was approximately 2.3 m, and was a complete barrier for fish passage with the dam-boards in place. The riparian area was dominated by sagebrush and grass.

21. Butter creek at RM 19.7 was sampled (160 m, 650 seconds) on May 15, 1996, beginning approximately 0.3 miles upstream from the confluence with Little Butter Creek. We caught one natural steelhead trout(288 mm) and observed approximately 600 suckers, 300 dace, 200 redside shiners and 30 sculpin. Water temperature was 17.5°C (64°F) at 9:00 am. Poor water quality, erosion, habitat degradation and other impacts by livestock had severely degraded the reach. Water was dark brown with foam and smelled like manure and fertilizer.

22. Butter Creek was sampled (220 seconds) on May 15, 1996, beginning at the Butter Creek Road bridge at RM 34.7 and ending 110 m upstream at a small bedrock cascade. We observed 115 redside shiners, 80 dace, 70 suckers and 15 sculpin. The stream flows were adequate and the temperature was 16°C (61°F) at 11:00 am. The riparian area was vegetated by short grasses that provided little shade. For several miles up and downstream of this site, passage barriers were abundant and habitat was degraded.

23. Butter Creek was sampled for 550 seconds on May 15, 1996, from Gurdane Road bridge at RM 48.5 upstream 160 m. We captured four steelhead averaging 236 mm and observed approximately 120 redside shiners, 80 suckers, 45 dace, and five sculpin. Water temperature was 14.5°C (58°F) at 1:00 pm. Adequate flows appeared perennial but severe erosion and lack of shade had degraded the habitat. High summer water temperatures may limit salmonid distribution and abundance in this section.

24. Butter Creek at RM 57.7 was sampled for 350 seconds on May 16, 1996. Crews sampled the 75 m downstream from the culvert. Eleven natural steelhead trout averaging 154 mm were captured. An estimated 20 sculpin, five redside shiners, and five suckers were also observed. Water was turbid and 12°C (54°F) at 9:45 am. The riparian area consisted of grasses and some shrubs. The stream had been channelized and had a slit substrate. Adjacent roads and cultivated fields contributed fine sediments. We observed an unscreened diversion 5 m below the culvert.

25. Johnson Creek at RM 0.3 was sampled for 175 seconds on May 16, 1996 from the culvert at Hoodlum Canyon Road upstream 60 m. We captured 16 steelhead averaging 116 mm in excellent physical condition. Water temperature was 12.5°C (55°F) 1:00 pm. The riparian area was in poor to fair condition and was dominated by short grasses with the occasional tree and shrub. Cultivation of adjacent fields narrowed the riparian vegetation (2 m) and contributed to bank erosion. The substrate was gravel, sand, and cobble. This section had adequate salmonid spawning and rearing habitat with water clarity superior to Butter Creek (RM 57.7). The culvert formed a 0.8 m high passage impediment.

26. Little Butter Creek at RM 12 was electrofished on May 13, 1996 (110 m, 220 seconds). The site was approximately 1.2 miles downstream of Newman Canyon and began 200 m upstream of an irrigation bridge. Approximately 15 dace, 10 sculpin and no salmonids were observed. Water temperature was 14°C (57°F) at 1:00 pm. The riparian area was 3 m wide with a dense growth of shrubs and grasses. The ratio of active to wetted channel was 1.2: 1. The substrate was a mix of clay, gravel, cobble and silt. A paved road running parallel to the creek did not appear to have impacted the creek to the extent that agricultural fields and livestock grazing had. This section of creek appeared to have rearing potential for salmonids.

27. Little Butter Creek, at the bridge 800 m upstream from the mouth of Jones Canyon Creek (RM 19.3), was sampled on May 13, 1996 for 135 seconds. Crews sampled under the bridge and 30 m on each side. One natural steelhead (223 mm) was captured and about 20 sculpin and three speckled dace were observed. Water temperature was 13°C (55°F) at 2:30 pm. The majority of substrate was gravel and cobble. Flows were adequate and appeared perpetual. This section appeared to have valuable rearing habitat with only moderate affects from livestock.

28. On a tributary joining Little Butter Creek at RM 26.6, we electrofished for 100 seconds on May 13, 1996. We sampled upstream 100 m from the second bridge (2.2 miles upstream from the confluence with Little Butter Creek). Eight steelhead averaging 161 mm were captured and may have originated from private ponds upstream. Water temperature was 15°C (59°F) at 3:00 pm. The stream appeared ephemeral, but the riparian area was in fair condition and provided seasonal habitat.

29. Jones Canyon Creek joins Little Butter Creek at RM 18.8. On May 13, 1996, we electrofished (100 seconds) a 60 m reach just downstream of the bridge at RM 0.2. We captured one natural steelhead (246 mm) and observed two dace. Water temperature was 14°C (57°F) at 2:00 pm. The active to wetted channel ratio was 1.2: 1. Except where grazed at the site's upper end, the grassland meadow habitat provided abundant instream cover.

30. East Fork Butter Creek was sampled for 120 seconds on May 15, 1996, from the mouth upstream 50 m. We captured four steelhead averaging 224 mm and observed about five suckers, 10 dace, 10 redside shiners, and 10 sculpin. Water temperature was 15.5°C (60°F) at 2:00 pm and appeared suitable for salmonids all year. Gravel and cobble dominated the substrate. The narrow valley configuration appeared to benefit the stream by limiting access to livestock and cultivation.

31. East Fork Butter Creek was electrofished for 185 seconds on May 15, 1996. We sampled from the bridge at RM 5.5 upstream 70 m. We captured 14 steelhead averaging 196 mm and observed approximately 25 sculpin and five suckers. Water temperature was 13.5°C (56°F) at 2:30 pm. Gravel was the most abundant substrate. Riparian habitat had been degraded by livestock but several large cottonwood trees remained.

32. Webb Slough Creek at RM 6.7 (a Butter Creek tributary at RM 48) was sampled for 75 seconds on May 15, 1996. We electrofished 15 m on each side of Gurdane Road (200 m west of Highway 395). No fish were observed. Water temperature was 13.5°C (56°F) at 3:00 pm. The salmonid rearing potential of this reach appeared limited by intermittent flows. The creek had been channelized, and riparian areas were grazed and cultivated.

33. Alkali Canyon Creek at RM 13.2 (Umatilla River tributary at RM 27.2) was electrofished for 80 seconds on May 21, 1996. We sampled from 60 m downstream to 10 m upstream of the Alkali Canyon Road culvert. No fish were observed. Water temperature was 13.5°C (56°F) at 12:00 pm. This reach-appeared ephemeral but had adequate salmonid cover. Cattle were grazing riparian vegetation consisting of grasses, sagebrush, shrubs, and trees.

34. Coombs Canyon Creek (Umatilla River tributary at RM 48.2) was electrofished on May 21, 1996, for 135 seconds. We sampled 100 m below the Ranch Road culvert at RM 0.9. No fish were observed. Water temperature was 13.5°C (56°F) at 2:00 pm, and silt was the primary substrate. The reach appeared ephemeral and had been altered by livestock, cultivation, channelization, bank erosion and runoff from adjacent dirt roads. The riparian area was dominated by grasses, sagebrush, and cattails.

35. Ray Creek (1.4 miles east of Pilot Rock) was sampled for 110 seconds on May 23, 1996, from the mouth upstream 8.5 m. No salmonids and 12 dace were observed. Water temperature was 13°C (55°F) at 9:45 am. This reach appeared ephemeral and could only provide seasonal salmonid habitat.

36. Ray Creek at RM 0.5 was sampled for 100 seconds on May 23, 1996, from the Rocky Ridge Road upstream 85 m. No fish were observed, and the water temperature was 13°C (55°F) 8:30 am. The riparian vegetation of this ephemeral reach consisted only of grass. Cultivated fields were abundant upstream.

37. Red Elk Canyon Creek (Umatilla River tributary at RM 73.9) was electrofished for 550 seconds on May 23, 1996. We sampled from the mouth upstream 210 m. We captured 23 steelhead averaging 90 mm and observed approximately 50 dace and 20 sculpin. Most of the fish were observed below a developed spring flowing from a pipe located 75 m from the mouth with at temperature of (9.5°C (49°F) at 12:00 pm). The spring contributed 80% of the flow and reduced the stream temperature from 12.5°C (55°F), to 10.5°C (51°F). The Mission Highway bridge (280 m from the mouth) formed a 0.8 m high passage impediment or barrier (low flow). The stream had been channelization above and below the railroad bridge.

38. Red Elk Canyon Creek was sampled for 240 seconds on May 23, 1996, for 90 m on each side of the ford at RM 1.0. No fish were observed. Water temperature was 13.5°C (56°F) at 2:00 pm. Despite livestock grazing in the riparian zone, habitat conditions were good and grasses, shrubs, and trees were abundant. Riffles were the most common stream habitat. This ephemeral reach could provide seasonal salmonid habitat if passage at the Mission Highway bridge was improved.

39. A tributary of the Umatilla River at RM 80.7 was electrofished for 35 seconds on July 23, 1996, from the Bingham Road culvert upstream 15 m. The tributary flowed from the north and was the third tributary downstream from the mouth of Ryan Creek. Two steelhead averaging 89 mm were captured. The reach had gravel and cobble substrate and complex riparian shading and cover. While the reach had quality habitat, the ephemeral system appeared to provide only seasonal habitat.

40. A tributary of the Umatilla River at RM 81.2 was sampled for 245 seconds on May 23, 1996, from the mouth upstream 110 m. This tributary flowed from the north and was the second tributary downstream from the mouth of Ryan Creek. Ten meters upstream from the mouth, the culvert under Bingham Road formed a 0.6 m impediment to fish passage. Below the culvert we captured six steelhead averaging 112 mm but observed no fish above the culvert. The quality habitat above the culvert appeared to be inaccessible. Rapids over boulders, riffles with pockets and pools were the most common habitat types. This tributary had about twice the flow of the tributary listed above (#39).

41. A tributary of the Umatilla River at RM 81.6 was electrofished (40 seconds) on May 23, 1996, from the Bingham Road upstream 10 m to a bedrock cascade. This tributary flowed from the north just downstream from the mouth of Ryan Creek. No fish were observed below the cascade that appeared to block fish passage. Downstream from the highway, the stream ran approximately 40 m to the Umatilla River. The habitat had been moderately degraded by the removal of shrubs and gravel. At the landowner's requested, we did not sample the lower reach.

42. Rock Creek, a Umatilla River tributary at RM 86.3, was sampled for 280 seconds on May 24, 1996 from Bingham Road Bridge at Bar M Ranch upstream 90 m. Nine natural steelhead averaging 160 mm were captured. The stream and riparian area was in excellent condition. Rapids over boulders and riffles with pockets were the most abundant habitat types. A multiple layered canopy and dense vegetation provided excellent riparian stability, shading and cover. Below the site, the stream had been severely degraded by livestock confined in a corral.

43. Bear Creek, a tributary of the Umatilla River at RM 87, was sampled on May 24, 1996, for 85 seconds from the Bingham Road Bridge upstream 30 m. We captured seven juvenile steelhead (105 mm) and observed five sculpin. Rapids over boulders and riffles with pockets were the dominant habitat types.

Water clarity and ripatian habitat conditions were excellent. This stream provides perennial salmonid rearing habitat.

44. A tributary of the South Fork Umatilla River at RM 1.4 was sampled (160 seconds) on May 24, 1996 for 150 m upstream from the culvert of USFS road 32 (an extension of Bingham Road). No fish were observed. The substrate was composed of sand, gravel, cobble and boulders. Pools, pocket water and instream woody debris were abundant and provided good salmonid habitat. However, the culvert created a 0.5 m passage impediment. Previous electrofishing has shown the presence of salmonids downstream of the culvert but not upstream.

45. Lick Creek, a tributary of the Umatilla River at RM 88.9, was sampled for 270 seconds on May 24, 1996, upstream 80 m from the gate on USFS Road 32. Eleven steelhead averaging 89 mm were captured. The gravel, cobble, and boulder substrate provided abundant pocket water. The channel and riparian area in the first 50 m of the site had been degraded by channelization and gravel removal. The stream appeared to provide perennial salmonid habitat.

46. Buck Creek (at RM 0.4), a tributary of the South Fork of the Umatilla River at RM 0.5, was sampled 400 seconds on May 24, 1996. We sampled a 135 m reach upstream from the Kiwanis Cabin at the trailhead of USFS trail 3073. Eighteen steelhead averaging 100 mm were captured. The streams had stable banks, an averaged depth of 0.3 m and substrate comprised of boulders, cobbles, and gravel. Rapids over boulders were the most abundant habitat followed by pools and pocket water. A multiple layered canopy and dense vegetation provided excellent riparian stability, shading and instream woody debris. The wetted channel was almost as wide as the active channel. Buck Creek provides quality water at significant proportions to the South Fork Umatilla River.

47. North Fork Meacham Creek at RM 3.2 was sampled for 320 seconds on May 31, 1996, from 800 to 910 m upstream from the mouth of Bear Creek. We observed 20 sculpin and captured 18 steelhead (mean 105 mm) and one whitefish (345 mm). The North Fork provides the majority of flow to the mainstem. The stream has clear water, a developed riparian area and a substrate consisting of cobbles, boulders, gravel, and sand. Bright green algae covered the substrate. The active channel was unstable in some areas and trees had been harvested from the riparian area and adjacent uplands at least a decade ago.

48. Bear Creek, a tributary of North Fork Meacham Creek at RM 2.7, was sampled for 265 seconds on May 3 1, 1996 from the mouth upstream 200 m. We captured 12 steelhead averaging 124 mm and observed 15 sculpin. The stream had many undercut banks, abundant woody debris and substrate consisting of gravel, cobble, and sand. Riffles with pockets and lateral scour pools were the most abundant habitat types. The stream had perennial flows and a well developed riparian area that provided excellent salmonid habitat with abundant shade and cover.

49. We electrofished 50 m of West Birch Creek at RM 16.5 on August 8, 1996, for 225 seconds. We captured five steelhead averaging 168 mm The stream had been moderately impacted by an adjacent road, livestock grazing and the removal of trees.

50. We electrofished Spring Hollow Creek on September 24, 1996 for 1,500 seconds. Spring Hollow Creek is a tributary of Wildhorse Creek at RM 13.8. The site extended 1,000 m downstream from the Spring Hollow road bridge at RM 3.2. We captured approximately 100 speckled dace and no salmonids. The creek had been degraded by livestock grazing and the cultivation of adjacent fields. Most of the stream bank was actively eroding and the substrate was predominantly silt and sand with some gravel. The riparian area had been reduced to a thin (4 m) strip of grass with a few trees and provided little shade or cover. Pieces of old farm machinery were common in the stream.

OBJECTIVE 3: Smolt Trapping

Task 3.1: Install and operate rotary screw traps in Umatilla River.

The rotary screw trap in the Umatilla River at Imeques C-mem-ini-kern (RM 79.5) operated 159 out of 276 days from September 7, 1995 through June 9, 1996. The trap was not operated during three high flow events when an unknown proportion of the salmonid emigration occurred. The trap captured the following number of juvenile salmonids: 3,765 natural steelhead, 2,135 natural chinook, 803 hatchery

chinook, 401 mountain white fish, and 11 bull trout. We estimated that 28,214 natural steelhead, 6,188 natural chinook, 12,348 hatchery chinook, and 16,814 mountain whitefish moved past the trap during the 159 days the trap was operated (Table E-l). Mean daily recapture rates fluctuated from 0 to 100% with a mean rate of 28.7% for natural steelhead, 57.6% for natural chinook, 13.3 % for hatchery chinook and 16.7% for mountain whitefish.

The rotary screw trap at the Barnhart site (RM 42.6) operated 41 out of 44 days from October 10, to November 22, 1995. The trap captured 37 juvenile steelhead with a mean trap efficiency rate of 14% (4 recaptured from 28 marked and released) for an estimate of 259 juvenile steelhead passing the trap. A total of 42 juvenile chinook salmon were captured with a mean trap efficiency rate was 28.6 % (10 recaptured out of 35 marked and released) for an estimate of 116 juvenile chinook passing the trap during the 41 days (Table E-l).

The rotary screw trap in Meacham Creek near the mouth (RM 1.5) operated 24 out of 29 days from May 8, to June 6, 1996. Total catch, mean catch rate and outmigrant estimate were 449, 14.2% and 3,172 for natural steelhead, and 112, 11.1% and 966 for hatchery chinook, respectively. Only one natural chinook was captured (Table E-l).

Eleven bull trout ranging from 222-320 mm in length were captured in the Imeques trap from September 27, to November 13, 1995. Only one of the eleven bull trout was recaptured (9.1%). An estimated 121 bull trout moved past the trap during the fall of 1995. In comparison, 19 and 139 bull trout were trapped during the previous two seasons (1992-94 and 1994-95). Previously, the decline in catch was thought to be related to moving the trap 3.5 miles down stream during the 1994-95 season. However, only 11 were captured during the fall of 1995 (none in the spring of 1996) in almost the same site where 139 bull trout were captured two years earlier.

Several uncertainties affect the evaluation of trap data regarding naturally produced smolts emigrating from the basin. These uncertainties include large day to day variation in trap catch rates, lack of recaptures, low catch, winter mortality of fish moving past the trap in the fall before they leave the basin in the spring, the unknown number of salmonids passing the trap during the days the traps were not operated and the unknown proportion of steelhead that remained at least one more year before emigrating.

Emigration from the headwaters (past RM 79.5) by juvenile steelhead and chinook salmon during the last three years peaked in October and again during April and May (CTUIR 1994, Contor et al. 1995 and 1996). Fish continue to move downstream at lower rates throughout the winter. Portions of the population move out of the headwaters in the fall to utilize habitat made available by water temperatures dropping below 20°C (68°F). Considerably more juveniles were estimated to have emigrated past the Imeques trap in October and the first half of November than during all of December, January, March, April and May combined. Peak emigration from the headwaters during the fall of 1995 was consistent with observations the previous trapping season in the Umatilla River (Contor et al. 1995, 1996) and in Lookingglass Creek (Lofy and McLean 1995a, 1995b).

Task 3.2: Freeze brand fish for interrogation in the lower Umatilla and Columbia Rivers.

At the Imeques C-mem-ini-kern trap, October 6, 1995 to May 26, 1996, crews freeze branded 1,803 natural juvenile chinook salmon, 1,618 natural juvenile steelhead, 12 hatchery juvenile chinook, 270 mountain whitefish and 8 bull trout (Tables E-l and E-3). At the Meacham Creek trap, May 20 and 21, 1995, crews branded 18 juvenile steelhead. At the Barnhart trap, November 1, to 22, 1995, crews branded 28 natural juvenile chinook salmon and 24 natural juvenile steelhead.

Recapture rates were low. Eighteen branded chinook and eight branded steelhead were recaptured by ODFW in their traps at RM 1.2 and TMD (Tables E-2 and E-3). Eight branded chinook were also recaptured at our rotary trap at RM 42.5. Based on these recaptures, we estimated 14,900 juvenile chinook and 100,500 juvenile steelhead immigrated from the Umatilla River headwaters and migrated through the lower Umatilla River. This estimate was biased by low recapture rates and unknown proportions of marked and unmarked fish moving through the lower river during floods. Unmarked fish from the entire basin may not all immigrate during the same times and in proportion to fish marked at the Imeques site. Low recapture rates and flooding prevented consistent sampling and sufficient recaptures to determine if the marked steelhead immigrated proportionately throughout the spring as unmarked steelhead.

Brand retention was estimated by holding juvenile steelhead and chinook at the Minthorn Springs Satellite Facility and examining them once a month from December 15, 1995, to April 23, 1996. By April, the retention of brands by chinook and steelhead varied considerably between groups and averaged 85 % for chinook and 79% for steelhead (Table E-4). Chinook had good, poor and unreadable brands at 21, 64 and 15%, respectively while steelhead rankings were 28, 52 and 20%, respectively.

During the floods, the water supply was disrupted several times and fish were repeatedly subject to poor water quality with high loads of suspended sediment. Of the 382 chinook and 374 steelhead branded and held at Minthom, only 276 (72%) chinook and 141 (37%) steelhead survived to the April examination. We observed 51 chinook and 138 steelhead mortalities and were unable to account for 55 and 95 others, respectively.

OBJECTIVE 4: Age and Growth

Tasks 4.1: Age analysis of adult and juvenile salmonids.

Based on scale analysis, 63 % of the Umatilla River natural summer steelhead returning to spawn in 1996 were from the 1992 brood year, 34.1% were from the 1991 brood year, and 2.3 % were from the 1990 brood year (Tables F-l and F-2). Eighty-one percent reared for two years in freshwater and 18.2 % reared for three years (Tables F-3 through F-5). During the last three years the proportion of adult natural steelhead that had reared two and three years in fresh water has ranged from 64.3 % to 8 1.8 % (2 +) and 17.4% to 35.7% (3+), respectively. Seventy-nine percent of the 1996 natural steelhead examined spent one year in the ocean (20.5% two years). Years of ocean residency has ranged between 46.0 % and 79.5 % for one ocean fish and 20.5% to 54.0% for two ocean fish (Table F-6). Based on scale analysis and CWT data, returning adult hatchery steelhead were predominantly age 1.1 from the 1993 brood.

Summer steelhead were classified at TMD (1995-96) as either having spent one or two years in the ocean based on fork lengths less than or greater than 66 cm (26 in.). Natural steelhead were classified as 78.5% one-ocean and 21.5% two-ocean fish. At TMD the hatchery steelhead were estimated to be 66.8% one ocean and 33.2% two ocean fish (Zimmerman, CTUIR, personal communication). Classification of natural steelhead, at TMD, based on fork length was within one percent of that determined by scale analysis (1995-96 season).

Length and age data indicate that naturally produced adult steelhead are slightly larger than hatchery adults after a given ocean age, even though they are smaller at ocean entry (Table F-7). After release, hatchery smolts apparently lose their size advantage over natural steelhead when adjusting to natural feed and new environments.

Age analysis of natural juvenile steelhead (RM 1.5 to 52) captured in the Umatilla River below Pendleton during the summer indicated that most were 0+ (59 %) and 1 + (26%; Table F-8). Growth was more rapid in the lower river than fish examined previously from upstream. However, a summer growth check on a portion of the scales indicated that fish were stressed by high water temperatures and/or poor water quality. Smolts captured by ODFW at TMD were mostly age 2+ (84%) or 3 + (15%; Table F-9). Coded-wire tag recoveries indicated that hatchery spring chinook salmon adults were 1.4% age 3 +, 92.2% 4+ and 6.4% 5+.

OBJECTIVE 5: Spawning Surveys

Task 5.1: Determine the final disposition of adults salmonids released above TMD.

Summer Steelhead

The estimated disposition of 1,296 natural and 785 hatchery summer steelhead trapped at TMD between September 5, 1995 and June 24, 1996 follows: 102 natural and 31 hatchery summer steelhead were taken for broodstock; 73 hatchery adults were sacrificed to recover CWTs; eight natural steelhead were

handling mortalities; 39 hatchery adults were harvested by tribal anglers, and 25 hatchery steelhead were harvested by sport anglers (Mike Hayes, **ODFW,** personal communication). The remaining 1,186 natural and 617 hatchery summer steelhead were available for natural spawning.

Spring Chinook Salmon

The estimated disposition of 2,152 adult and 121 jack spring chinook salmon trapped at **TMD from** March 29 to June 27, 1995 follows (Zimmerman and Duke 1996): eighteen adults and 39 jacks were either sacrificed to recover CWTs or were handling mortalities; 2,134 adult and 82 jack spring chinook salmon were released at or above TMD; 167 adult salmon were harvested by tribal anglers; 205 spring chinook salmon were harvested by sport anglers between Rieth Bridge (RM 48.3) to the Highway 11 Bridge in Pendleton, and one spring chinook salmon was harvested by a sport angler from the upper river (RM 81.9 to 89.9; Mike Hayes, ODFW, personal communication). The remaining 1843 salmon were available for natural spawning (Table G-6).

Fall Chinook and Coho Salmon

The estimated disposition of 603 adult and 626 jack fall chinook and 946 adult and 53 jack coho salmon trapped at TMD between September 5 and December 1, 1995 follows: 88 adult and 107 jack fall chinook were sacrificed for CWTs; 841 adult and 19 jack coho salmon were taken for broodstock; 515 adult and 519 jack fall chinook and 105 adult and 34 jack coho salmon were released above TMD and were available for natural spawning.

Tasks 5.2: Conduct pre-spawning, spawning, and post-spawning surveys throughout the basin for spring chinook salmon. Conduct limited spawning surveys to determine general distribution and timing for summer steelhead, fall chinook salmon and coho salmon as conditions allow.

Summer Steelhead

During summer steelhead escapement surveys, we observed 34 steelhead on 121 redds (5.6 redds/mile) from March 1- May 3, 1996 in index areas of 21.7 miles of lateral tributaries of the upper Umatilla River (Table G-l). In addition, 12 redds were observed in areas not annually surveyed, and six redds were found in Meacham Creek which was generally too high to survey during the spring of 1996. ODFW conducted escapement surveys on 8 miles in the Birch Creek Basin and observed 23 redds (2.9 redds/mile). **ODFW** captured 149 steelhead at their weir on Birch Creek and estimated 373 summer steelhead passed the trap based on a limited mark-recapture estimate.

Conditions for observing redds were generally excellent in the smaller tributaries from March 1 through April 22. We discontinued steelhead redd surveys after April 23, 1996, when heavy rains caused high flows to wash out the surface features of redds. Redds previously marked in Buckaroo, Camp and the North Fork of Meacham Creek were no longer visible. We did not surveys Meacham Creek because of the late April floods.

Spring Chinook Salmon

During spring chinook salmon escapement surveys, we counted 347 redds (11.6 redds/mile) and sampled 740 carcasses along 30.0 miles of the Umatilla River Basin between June 16 and September 30, 1996 (Table G-4). Total spring chinook observed at TMD was 2273 for a ratio of 6.5 fish/redd. Subtracting jacks and harvest estimates from the known number of spring chinook released above TMD provided a ratio of 5.1 adults/redd. In previous years radio-tagged spring chinook fell back (13-30%), if non-tagged chinook fall-back at similar rates the ratios would range from 4.1 to 4.6 adults/redd (Contor et al. 1996).

We recovered 740 (40%) of the 1843 spring chinook salmon available for natural spawning (Table G-5). A total of 141 CWTs were recovered from 166 snouts from marked spring chinook salmon. Eighty percent of the tags were from spring chinook reared at Bonneville Hatchery, 17.7% were from Umatilla Hatchery and 2.1% were fish reared at Lyons Ferry Hatchery and released in the Tucannon River.

Based on carcass examinations, survival to spawning of spring chinook salmon averaged 63.7% and was the lowest rate observed to date. Survival was highest in the colder headwaters and decreased downstream as water temperatures increased as follows: survival to spawning was 95.5% in the North Fork of the Umatilla River; 86.8% between the Forks and Fred Gray's Bridge (RM 89.9-80); 80.9% from Fred Gray's Bridge to the Meacham Creek confluence (RM 80-79); 47.5% from the confluence of Meacham Creek to Squaw Creek (RM 79-76.7); 40.0% from Squaw Creek to Louie Dick's fence (RM 76.7-70.0), and 15.3 % between Louie Dick's fence and Minthom Spring's (RM 70.0-64.5; Table G-7). Observed pre-spawning mortality was 20% in Meacham Creek. The rate was biased because sampling was not conducted when many of the pre-spawning mortalities occurred. We monitor Meacham Creek less intensively because few salmon spawn in that system.

Timing of spring chinook salmon redd construction varied between early August and late September. In the colder headwaters, spawning was several weeks earlier than in the warmer areas (Figures G-l through G-8). Mortality of spawned-out spring chinook salmon began in mid August, peaked in mid September and was completed by October 1, 1996. Pre-spawning mortalities were first observed in early June and peaked from early August to mid September (Figure G-2).

To assist the rapid development of naturally sustaining spring chinook salmon, more adults need to spawn in the North Fork of Meacham Creek and the upper reaches of the Umatilla River. In 1996, as in past years, many spring chinook released in various locations in the lower river have not migrated to the colder headwaters. Most of the adult chinook holding in the lower reaches died before spawning. Others spawned where their progeny's survival was jeopardized by high temperatures during incubation and poor rearing conditions. This has been especially evident in Meacham Creek and the mainstem Umatilla River below Meacham Creek.

Fall Chinook and Coho Salmon

High, turbid flows limited the number and effectiveness of spawning surveys conducted during the fall. We surveyed nine miles of the Umatilla River above TMD from November 6 through December 21, 1995. Surveyors sampled one adult fall chinook and observed nine fall chinook salmon redds, one coho salmon redd and one unidentified redd.

One male coho salmon and four spawned out fall chinook salmon (two females, two males) were found below TMD (RM O-4) where bedrock and lack of gravel make spawning difficult. We surveyed below the dam primarily to recover CWTs and evaluate passage conditions. During the past several years, fewer adult salmon have held and spawned below TMD. Augmenting flows and acclimating and releasing juveniles farther up in the basin may encourage more adult salmon to move and spawn above TMD.

We also surveyed McKay Creek from below the dam (RM 6) to the Umatilla River after the stream was de-watered. Few adult salmon used this tributary in 1995. We observed one coho redd and sampled a spawned out female coho and a jack fall chinook salmon.

OBJECTIVE 6: Adult Passage Evaluations.

Task 6.1: Evaluate the upstream migration of radio-tagged adult salmon and steelhead past the irrigation diversions in the lower Umatilla River.

Fall Chinook Salmon and Coho Salmon

A total of 20 fall chinook salmon were radio-tagged and released at TMD between September 27 and October 31, 1995. Of these, 12 successfully migrated over Westland Diversion Dam, 11 (of the 12) negotiated Feed Canal Dam, and eight (of the 12) successfully passed Stanfield Dam. Of those remaining, three regurgitated the radio transmitter and five remained in the river between TMD and Westland Dam.

Between September 27 and October 25, 1995, a total of 19 coho salmon were radio-tagged and released at TMD. Eight of these passed Feed Canal Dam, seven (of the eight) passed Stanfield Dam, and four (of the eight) passed ODFW (RM 56). Of the remaining 11 coho salmon, six regurgitated the radio transmitter, two could not be relocated after tagging, and three remained between TMD and Westland Dam.

Peak migration for fall chinook and coho salmon in the Columbia River at McNary Dam occurs during the month of September. As a result of insufficient attraction flows, entry at TMD is delayed with significant numbers of fall chinook and coho salmon entering in mid to late October. By this time, these fish are entering advanced stages of maturation and thus reduced physical condition. The potential of these fish to successfully migrate to headwater sections of the Umatilla River Basin is remote.

Telemetry data collected during the last three years is indicative of sexually mature fish and portrays the movements of fish at or near spawning. Ripe adults at TMD and numerous fall chinook and coho salmon spawning below TMD are evidence of this occurrence. In 1995, 17 fail chinook salmon provided data. Of these, 12 migrated above Westland Dam; none migrated up to site four at ODFW (RM 56) in Pendleton. Of the 13 coho salmon providing data in 1995, seven passed Stanfield Dam and-four successfully migrated to site four at RM 56.

Telemetry data has shown that the majority of fall chinook and coho salmon released at TMD in October and November will spawn within 20 miles of the release point. Data has also demonstrated that fish tagged early in the migrational period consistently migrate further upstream. This strongly indicates that timing of attraction flows at the mouth of the Umatilla River are of major concern.

Currently, returning adult levels for naturally produced fall chinook and coho salmon in the Umatilla River are below basin goals. If goals are to be met, management strategies for these species require reconsideration. By providing attraction flows in early September, returning fall chinook and coho salmon entering TMD will be in better physical condition and thus more capable of migrating to upper basin locations and choosing acceptable spawning sites. This effort combined with habitat improvements, trap and haul, and minimum flow regimes necessary for rearing and outmigration, will improve the potential for increased natural production of these fishes.

Summer Steelhead

A total of 30 summer steelhead were radio-tagged between October 4, 1995 and April 16, 1996. Of these, 15 provided data past all of the major diversion dams (TMD to above Stanfield Dam). Of those remaining, five could not be located after release, six regurgitated the radio transmitter, two fell over TMD and two others failed to migrate passed Feed Canal Dam.

Annual average passage times through the diversion areas for summer steelhead have remained similar in the last three consecutive years. On average, 36 days were required to migrate from TMD to above Stanfield Dam (Appendix H, Table H-l). Thirty-six days were required to complete this distance in 1994-95 and 29 days in 1993-94 (Tables H-2 and H-3). Average migrational passage times (hours and minutes) required to negotiate Westland, Feed Canal, and Stanfield dams were 13:06, 39:54, and 5:52, respectively (Table H-l). This compares to 13:06, 83:24, and 3:00 in 1994-95 and 1:30, 48:54, and 1:24 in 1993-94 (Tables H-2 and H-3). Twenty one percent of the fish chose to use the fish ladder at Westland, 53% at Feed Canal, and 33% at Stanfield (Table H-l). Average passage times between diversions, at diversions, and passage routes for fall 1993 through spring 1996 are provided in Tables H-l through H-3, and Figures H-l and H-2. Combined (by site) passage data for Westland, Feed, and Stanfield dams for years 1993-96 are provided in Tables H-4 through H-6.

Flow ranges encountered during adult passage were 628-2,105 cfs at Westland, 834-2,561 cfs at Feed Canal and 930-3,590 cfs at Stanfield. Migrational delays were documented at Feed Canal Dam at flows ranging from 834 cfs to 2,506 cfs. Some delays also occurred at Westland and Stanfield Dams in the 600-3,590 cfs range. Average flows and temperatures for fall 1993 through spring 1996 in Tables H-l through H-3.

Generally, the rate at which summer steelhead migrate through the diversion areas (from TMD to above Stanfield Dam) is reflected by entry timing at TMD. Passage times through the diversion areas are longest for summer steelhead entering early in the migrational period (September-December). Fish entering later in the period and thus closer to spawning, such as in March or April, consistently migrate through the system more quickly.

Three years of passage data at Westland, Feed Canal, and Stanfield dams have been generated during this project. This data has conclusively demonstrated that passage problems exist at Feed Canal Dam. Combined (by site) passage time data for the last three consecutive years at Westland, Feed Canal, and

Stanfield Dams were 9:00, 56:48, and 3:30, respectively (Table H-4 through H-6). Individual annual average passage times at Feed Canal Dam have been as high as 83:24 in 1994-95. Its important to note that average passage times for Feed Canal Dam only represent fish that successfully negotiate the structure. Fish unable to negotiate the structure are not represented in this number.

It has been considered that the reach of the river near Feed Canal Dam may be responsible for passage delays rather than the dam itself. Figure H-5 illustrates that it is not the reach of river causing delay but rather the diversion dams within the reach. Clearly, summer steelhead display little difficulty ascending sections of the river without diversion dams. Once encountering sections with dams, migrational movements are severely reduced.

Although some increased migrational delays at Feed Canal Dam are likely in response to prevailing flows and gravel accumulations, facility design is the primary problem. Feed Canal Dam was designed for water diversion, not fish passage. The apron below the dam creates false attraction for ascending adults and prevents the formation of a plunge pool necessary for jumping over the crest of the dam. Fish approaching Feed Canal Dam are thus unable to jump the dam under most conditions and false attraction flows over the majority of the structure magnify the difficulty of locating the fish ladder. Attraction flows toward the fish ladder reduce this problem. This, however, is only a solution during low flows. During high flows, water spills over the entire crest, thus creating attraction away from the fish ladder and again migrational delays.

The consequence of delay below Feed Canal Dam on upstream migrants is unknown. For summer steelhead returning early in the migrational period, a small delay is probably insignificant. Late returning steelhead, however, and also spring chinook, fall chinook, and coho salmon are likely impacted. Timing for these fish is critical. Migrational delay and repeated attempts to negotiate the structure may be tapping into vital energy reserves needed for spawning. This, in turn, may promote pre-spawn mortality, impact distance migrated, and influence the selection of spawning sites.

As a result of Phase I and Phase II of the Umatilla Basin Project, fishery managers are increasingly considering natural migration as opposed to trap and haul for upstream migrants. This magnifies the importance of adequate passage for adults throughout the lower Umatilla River. Information gathered during this project should be used as intended. That is, to eliminate potential passage barriers for ascending adult salmonids. At this time, there are no plans for modification at Feed Canal Dam. It is paramount, that appropriate strategies for revision at Feed Canal Dam are begun. If not, upstream migrants will continue to be severely delayed with some migrants completely unable to negotiate the structure.

Spring Chinook Salmon

Between April 15 and May 3 1, 1996 a total of 20 spring chinook salmon were radio-tagged and released at TMD. Of these, 15 provided data past Stanfield Dam. Of those remaining, three regurgitated the radio-tag, one was recaptured at TMD and then hauled upstream and one could not be relocated after reaching Feed Canal Dam. Average time needed to migrate from TMD to above Stanfield Dam was 12 days in 1996 and averaged 13 days for 1994 and 1995 (Table H-7 and H-8). Average passage times (hours and minutes) at Westland, Feed Canal, and Stanfield dams were 03:27, 43:54, and 12:48, respectively (Table H-7). This compares to 28:30, 63:48, and 2:54 in the combined years of 1994 and 1995 (Table H-8).

Forty-five percent of the fish chose to use the fish ladder at Westland, 42 % at Feed Canal, and 69% at Stanfield (Table H-7, Figure). Average passage times between diversions, at diversions, and passage routes for spring 1994 through spring 1996 are provided in Tables H-7, H-8, and Figures H-3, and H-4.

Flows encountered during passage were 796-911 cfs at Westland Dam, 689-2772 cfs at Feed Canal Dam, and 675-3781 cfs at Stanfield Dam (Table H-7). Migrational delays occurred at Feed Canal Dam at flows ranging from 700 to 2,772 cfs. One chinook salmon was also delayed at Westland Dam at average flows of 796 cfs (Table H-7). No flow-related delays were documented for Spring Chinook Salmon at Stanfield Dam. Average flows and temperatures for spring 1994 through spring 1996 are in Tables H-7 and H-8.

In 1994 and 1995 (combined), spring chinook salmon required an average of 13 days (range of 3-28) to migrate through the diversion areas (TMD to above Stanfield Dam). In 1996, spring chinook salmon

required 12 days (range of 4 to 39 days)to complete the same distance. Typically, spring chinook salmon migrate through the lower portions of the Umatilla River faster than summer steelhead. This is likely a natural response to photoperiod and the need to reach headwater sections prior to unsuitable water temperatures. In the last three years, summer steelhead required an average of 29 days to migrate from TMD to Westland Dam, with several requiring more than 100 days. Spring chinook salmon required only six days on average to migrate through the same section of river (Tables H-l through H-3, H-4 and H-5).

During this project, several radio-tagged spring chinook salmon, including three in 1996, have fallen back and been recaptured at TMD. Although this behavior occurred in each year of the evaluation, it appeared more prevalent in low flow years. Telemetry data did not conclusively show that spring chinook salmon were falling completely out of the basin. It is prudent, however, to assume that some movement out of the system is occurring. It's therefore important that in-river harvest levels reflect this potential.

Like summer steelhead, spring chinook salmon have consistently demonstrated migrational delays at Feed Canal Dam. Although minor delays were observed in 1994 (11:58), delays increased in 1995 (89:42) and 1996 (43:54). Some of the annual variance in passage times is undoubtedly related to prevailing flow, temperature, and facility (gravel deposition) conditions. During moderate to high flow years, such as those experienced in 1995, much of the flow spilled over the crest of the dam and was directed away from the fish ladder. Couple this with gravel accumulations at the base of the dam that prevented migration toward the fish ladder and passage times increased dramatically. This was what occurred at Feed Canal Dam in 1995. In 1994, a lower flow year, most of the flow was directed toward the irrigation canal headworks and fish ladder. Under these circumstances, ascending adults were attracted toward the fish ladder and passage times were reduced accordingly. This did not suggesting, however, that spring chinook salmon were without migrational difficulties under low flow conditions. Telemetry data collected in 1994, a relatively low flow year, showed passage times at Feed Canal Dam were more than 15 times longer than those at Stanfield Dam in the same year.

Recommendations:

The telemetry portion of this project was concluded in the spring of 1996. As a result, valuable data was assembled. This information is valuable for managing the needs of upstream migrants in the basin. Data clearly demonstrated that modifications are necessary at Feed Canal Dam. Telemetry data identified this dam as the only significant barrier to upstream migrants (from above TMD to above Stanfield Dam) under adequate flow conditions. In the absence of modifications, large delays, injury, and impasse will continue to occur at the expense of salmonid fishes within the basin.

As mentioned previously, additional jump pools and fish ladders may help. The design of this facility, however, encourages false attraction and will likely continue to cause problems. Reconstruction in the form of a full channel fishway or dam removal are likely the best options for upstream migrants at this facility.

OBJECTIVE 7: Adult Passage Evaluations Following Upstream Transport.

Task 7.1: Evaluate movements of radio-tagged adult spring chinook salmon and summer steelhead following upstream transport.

Summer Steelhead

A total of 13 summer steelhead were radio-tagged between March 18 and April 30, 1996 as part of the upstream transport evaluation. Following release at Barnhart, eight fish migrated upstream above site four (RM 56), one fell back below Feed Canal Dam then reascended both Feed Canal and Stanfield dams, and another fell back below Westland Dam. The remaining three fish all regurgitated the radio transmitter.

On average, transported fish traveled 2.3 miles/day (1.7 in 1994-95, 5.2 in 1993-94) between Barnhart (RM 42) and site four (ODFW RM 56). In comparison, fish released at TMD traveled the same reach at 5.3 miles/day (4.1 miles/day in 1994-95, 5.9 miles/day in 1993-94; Table H-9 and H-10).

Summer steelhead included in the upstream transport evaluation were frequently transported when river conditions were questionable for natural upstream migration. This generally occurred in the spring and fall months. Telemetry data from these fish was therefore biased toward the behavior of fish during these periods. This places less importance on the exercise of comparing migration rates of transported fish to fish released over many months at TMD. Differences in the two groups are not critical but do provide a method of comparison. Ultimately, however, the purpose of the upstream transport evaluation was to determine whether transported summer steelhead successfully migrate to spawning locations. One fish in 1995 and two fish in 1996 failed to volitionally migrate upstream following release. In the last three years, however, 89% (25 out of 28) of the summer steelhead evaluated successfully migrated upstream following transport and release.

Swine Chinook Salmon

From April 30 to May 3 1, 1996 a total of 15 spring chinook salmon were radio-tagged at TMD and released at either Barnhart, Thornhollow, or Bear Creek. Of those released at Barnhart (11 fish), one migrated up to site four (RM 56) then fell back to Feed Canal Dam, all others successfully migrated above site four. Of those released at Thornhollow (3), one migrated upstream (one mile), one fell back to or below site four, and one was captured in the tribal fishery. The remaining fish released at Bear Creek could not be located after release.

On average, transported fish traveled 3.9 miles/day (4.8 in 1994) between Barnhart (RM 42) and site four (ODFW RM 56, Table H-l 1). In comparison, fish released at TMD traveled 7.7 miles/day (3.9 miles/day in 1995, 8.9 miles/day in 1994, Table H-12).

During the last three return years, a total of 31 spring chinook salmon have provided migrational data following upstream transport and release. Of these, 29 successfully migrated to spawning locations. Of interest, is the differences in migration behavior of salmon released at various sites. It's generally been thought that upper basin (Thomhollow, Imeques-C-mem-ini-kern) releases would result in less pre-spawn mortality. This may be true, although, upper basin releases may be causing other problems. The majority of salmon released at Thomhollow, or Imeques C-mem-ini-kern remained at or near the release site throughout spawning. This behavior greatly increased the potential of these fish to harvest and may promote over seeding of spawning areas. In contrast, radio-tagged salmon released at Barnhart or Nolin, naturally chose spawning sites over a larger portion of the basin. Furthermore, telemetry data did not suggest that lower basin releases at Barnhart and Nolin were less effective at promoting migration to acceptable headwater sections. Of 11 spring chinook salmon released at Bamhart in 1996, all passed site four at RM 56.

In recent years, adult counts on spawning surveys compared to release numbers at TMD have suggested spring chinook salmon are falling back into the lower Umatilla River and potentially out of the basin. As recent as 1993, an estimated 43 % of the spring chinook salmon released above TMD were unaccounted for (CTUIR 1994). Consistent with this data, several radio-tagged salmon, including transported fish and fish released at TMD, have demonstrated similar behavior. The basis of this occurrence is unknown. However, the annual percentage of fish falling back is significant (3 salmon in 1995-33 %, 2 salmon in 1996-13 %) and requires consideration when establishing Umatilla River harvest levels.

OBJECTIVE 8: Homing and Straying of Adult Salmonids

Task 8.1: Determine factors essential for homing and upstream migration of maturing salmonids.

Fall Chinook Salmon

Consistent with mainstem passage information (Table H-13), CWT data demonstrates that Umatilla River fall chinook salmon first enter the John Day Pool in late August with peak migration occurring in mid September (Kissner 1992, Wagner 1990). In 1993-95, significant numbers of fall chinook salmon entered the Umatilla River when flows reached or exceeded 150 cfs (Figures H-6, through H-8).

Homing rates for Umatilla River fall chinook salmon (all release groups) during the last four return years have ranged from a low of 23.8% in 1992 to a high of 67.6% in 1995 (Table H-14). Average attraction flows exiting the Umatilla River in early September (September 1-15, 1990-94) ranged from a low of 1 cfs in 1992 to a high of 83 cfs in 1995 (Table H-14). Acclimated versus direct release experiments of fall chinook salmon (Table H-15) show weighted average homing rates of 52.1% and 55.3 %, respectively. Homing rates versus age at release for Umatilla River fall chinook salmon were highest for age 1 + fish. Age one (1 +) fish had weighted average homing rates of 67.7 % while spring and fall releases of subyearlings (O+,O+ +) averaged 27.5% (Tables H-16 and H-17).

Entry for fall chinook salmon at TMD hinges on availability of attraction flows. Phase I provided minimum flow levels below TMD beginning in 1993. These flows, however, have not been significant enough to encourage migrational entry. Data clearly demonstrates that at least 150 cfs is required to encourage movement of both fall chinook and coho salmon into the Umatilla River. Without attraction flows at or near the mouth of the Umatilla River in late August and early September, straying and late entry of fall chinook salmon is likely.

It may be discovered, however, that some fall chinook salmon naturally migrate upstream of the mouth of the Umatilla River regardless of attraction flow levels. Migrational behavior of this type has been documented for both Umatilla River origin summer steelhead and spring chinook salmon at attraction flows far exceeding those experienced during the fall chinook salmon migration (Volkman 1994). Fall chinook salmon above the mouth of the Umatilla River, may simply be "testing" for Umatilla River water with the intention of dropping back if the Umatilla River is not detected. Once over McNary Dam however, they find passage back through the dam difficult and thus spend days if not weeks in the McNary pool and forebay before successfully falling back and entering the Umatilla River. Typically, a Umatilla River origin fall chinook salmon above McNary Dam is considered to be straying. In reality, this may be a natural part of the migrational process of these fish.

It would be interesting to observe entry dates of fall chinook salmon at flows exceeding 500 cfs in early September. Given these conditions, mainstem straying and thus delay may be significantly reduced. One might argue that historically flows at the mouth of the Umatilla River were not 500 cfs in early September. Historically, however, the Columbia River was not a reservoir as it is today. Lake-like conditions and thus poor water mixing in the mainstem may demand attraction flows far greater than was previously necessary. At this time, attraction flows in the Umatilla River are not fully understood. Until more information is gathered, minimum attraction flows should not be set.

Coho Salmon

Although coho salmon enter the Columbia River later than fall chinook salmon, entry timing at TMD is similar. Two-hundred cfs was required to encourage significant numbers of coho to enter the Umatilla River in 1993-95 (Figures H-6 through H-8). Large numbers of coho salmon entered the Umatilla River in 1995 when flows exceeded 600 cfs (Figure H-8).

Significant numbers (79.9% of the strays) of coho salmon released in the Umatilla River ultimately return to their rearing facility (Cascade Hatchery) at Bonneville Complex (Table H-18). Stray rates above McNary Dam are essentially zero. Homing rates for coho salmon (all release groups) during the 1987-1992 brood years have ranged from 58.3 % to 100%. Weighted average homing and straying rates for these same groups were 74.2 % and 25.8 % , respectively (Table H-l 8). Weighted average homing rates to the Umatilla River for acclimated versus direct releases of coho salmon were 63.8 % and 72.1% , respectively (Table H-19).

Summer Steelhead

Coded-wire tag data analyzed by Kissner (1992) showed summer steelhead in the mainstem Columbia River (Zone 6) from August 1 through October 31. Entry timing at TMD varies and can extend over ten months. Significant numbers of fish arrive in November and December with peak migration, typically occurring in February, March, and April.

In each of the last three return years, peaks of over 500 cfs (over 1,000 cfs in some years) were necessary to encourage significant numbers of summer steelhead to enter TMD (Figures H-9 through H-l 1).

Stray rates for Umatilla River summer steelhead have remained low. Despite this, Wagner reported (1990, Wagner and Hillson 1991) and mainstem telemetry data have demonstrated the movement of Umatilla River origin summer steelhead above McNary Dam.

Mainstem (Columbia River) data has demonstrated that some Umatilla River summer steelhead migrate above McNary Dam prior to falling back and ascending the Umatilla River (Wagner, 1990, Wagner and Hillson 1991, Contor et al. 1996). Despite this information, stray rates for summer steelhead have remained very low.

Entry timing for summer steelhead at TMD can begin as early as late August and extend into late May. Native summer steelhead have survived in the Umatilla River because of their ability to wait long periods of time, if necessary, between mainstem entry (Columbia River) and spawning (Kissner 1992). Stray rates associated with summer steelhead are extremely low. Unlike salmon, summer steelhead migrating above McNary Dam can have as long as ten months to fall back, relocate, and successfully ascend the Umatilla River.

Large flows are necessary to attract significant numbers of summer steelhead into the Umatilla River. Flows exceeding 500 cfs are required in most cases and as much as 1,500 cfs in some years. Summer steelhead will enter the Umatilla River under low flow conditions, but most enter during moderate to high flows.

Spring Chinook Salmon

Spring chinook salmon migration in the Umatilla River begins in early April and typically peaks in May. Migrational entry of spring chinook salmon versus flows varies greatly from one year to the next (Figures H-12, H-13, H-14). Migration to TMD will occur at flows ranging from 200 cfs to over 10,000 cfs. In 1995, 2,000 cfs was necessary to encourage migration. In 1994, 500 cfs was required.

Umatilla River spring chinook salmon stray rates remain low. Coded-wire tag homing data analyzed in 1995, showed homing rates (all release groups) for the recovery years of 1990-1994 ranging from 92.4% in 1994, to 99.9% in 1991 (Contor et al. 1996).

OBJECTIVE 9: Tribal Harvest

Tasks 9.1: Design and implement creel and phone surveys to estimate tribal harvest of adult anadromous salmon.

Tribal steelhead angling in the Umatilla River was monitored, with a stratified-random sampling design, for 550 hours during 44 days from December, 1995 through March,.'1996. Thirty-five tribal anglers were interviewed one or more times either while fishing or during telephone interviews. Thirty-nine hatchery adult steelhead were estimated to have been harvested by tribal anglers. Although not required, tribal anglers voluntarily released natural steelhead. Mike Hayes (ODFW, personal communication) estimated non-tribal anglers harvested an additional 25 hatchery steelhead (below the reservation boundary). Harvest of fall chinook and coho salmon was minimal as very little angling effort was observed as a result of poor returns. The tribal spring chinook salmon anglers harvested 167 salmon during 1996 compared to the 206 caught by sport anglers. Harvest quota was 200 spring chinook for each fishery.

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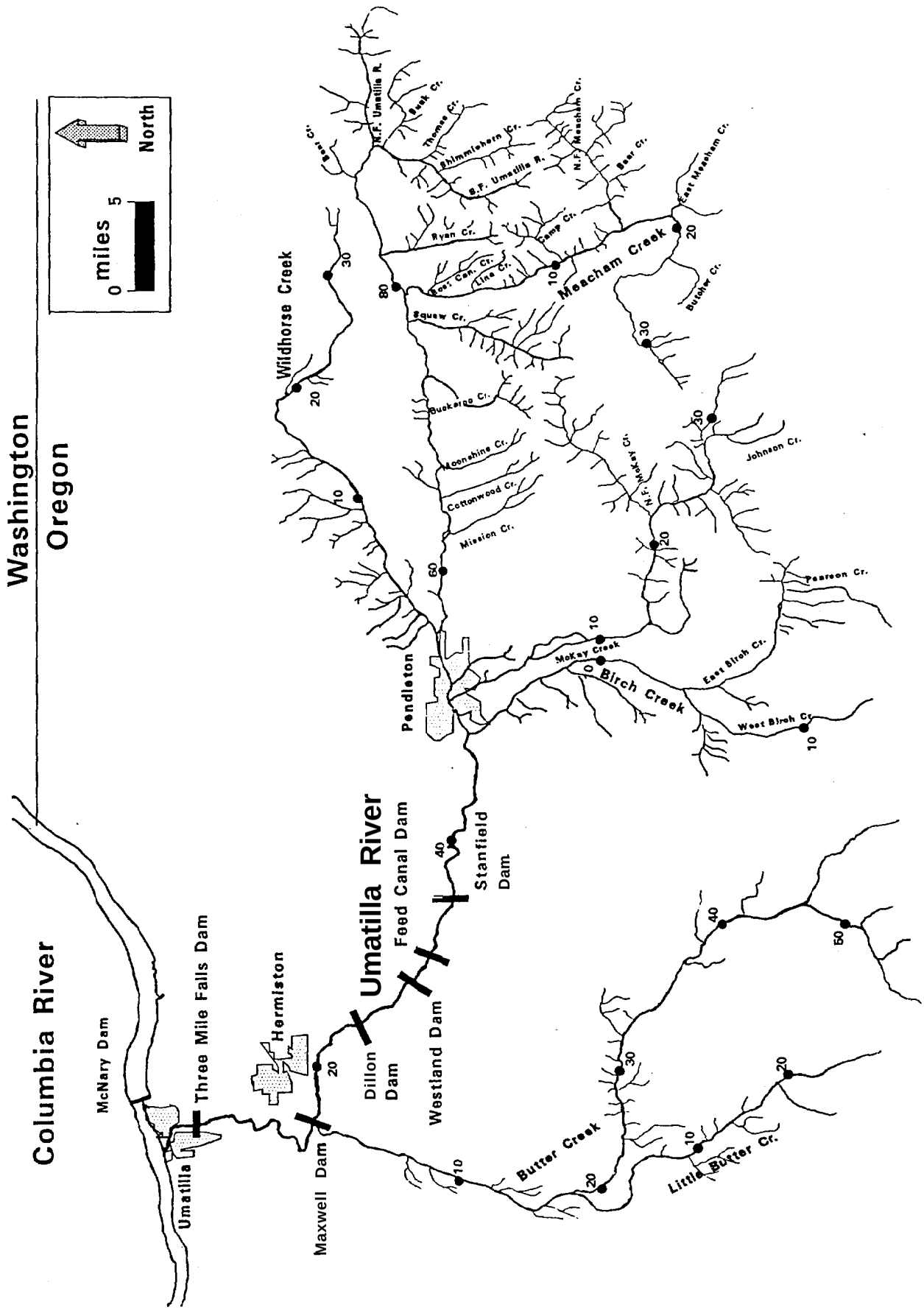


Figure A-1. Map of the Umatill River Basin with River Miles Denoted.

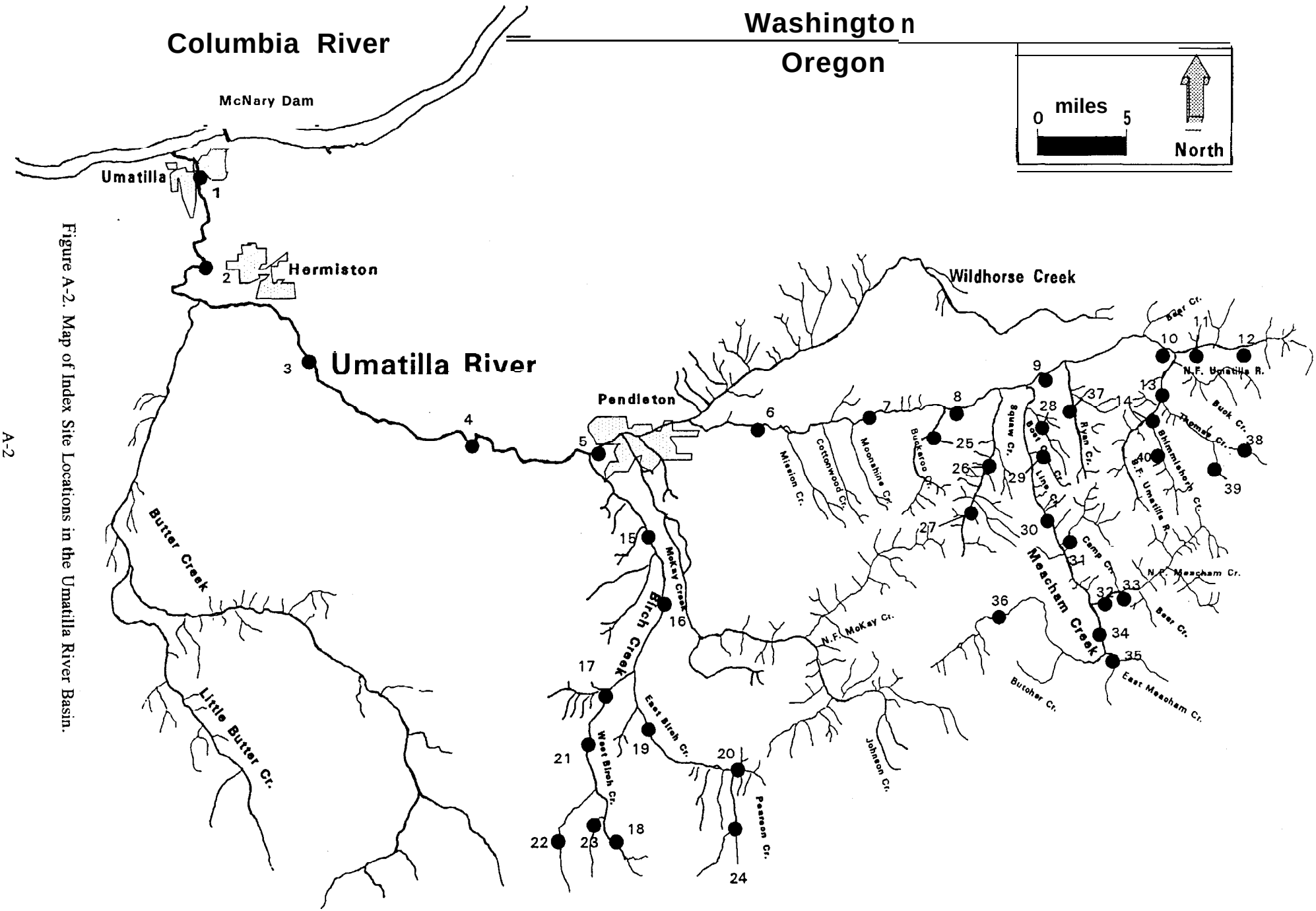


Figure A-2. Map of Index Site Locations in the Umatilla River Basin.

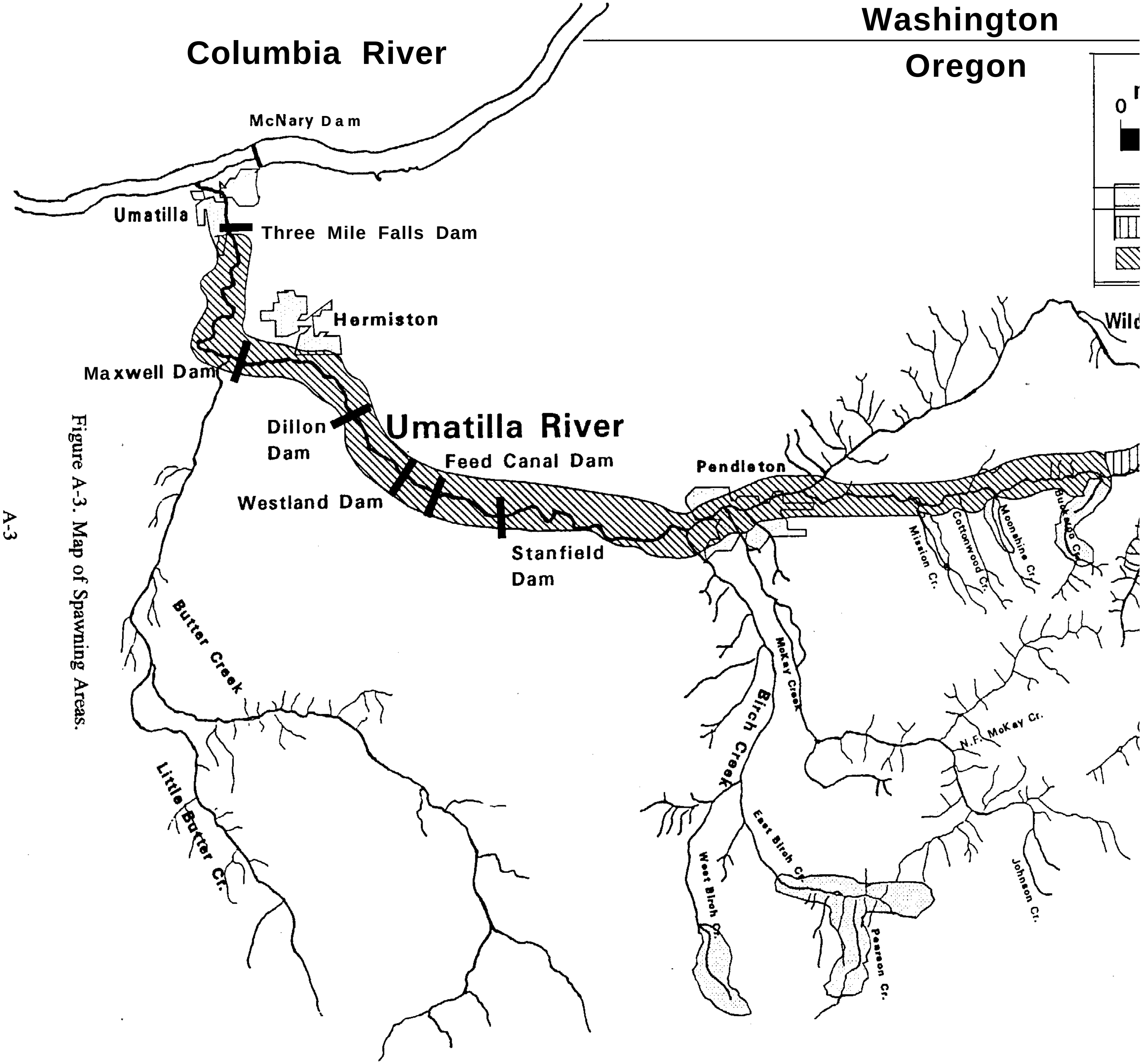


Figure A-3. Map of Spawning Areas.

APPENDIX B
Physical Habitat Surveys

Table B- 1. Habitat Unit Summary for the Umatilla River, RM 0 to 56.1, June 4, to August 1, 1996.

HABITAT DETAIL

Habitat Type	Number Units	Total Length (m)	Avg Uidth (m)	Avg Depth (m)	Total Area (m^2)	Large Boulders (#>0.5m)	Substrate Percent Wetted Area S/O	Snd	Grvl	Cbbl	Bldr	Bdrk
CASCADE/BEDROCK	1	20	4.5	2.00	88	0	0	0	0	0	0	100
DRY CHANNEL	2	61	6.9	0.00	414	0	30	15	50	5	0	0
DRY UNITS	1	20	1.8	0.00	35	0	0	10	90	0	0	0
GLIDE	280	23,756	15.2	0.75	505,090	1284	8	20	45	14	3	10
POOL-ALCOVE	3	189	25.8	1.29	8,299	1	57	37	3	3	0	0
POOL-BACKWATER	249	6,222	5.2	0.66	41,228	238	25	26	39	6	1	4
POOL-DAMMED	23	3,432	20.8	1.72	84,391	35	17	20	22	12	4	25
POOL-ISOLATED	87	4,688	3.4	0.53	17,544	58	35	37	25	3	1	0
POOL-LATERAL SCOUR	320	17,411	12.7	1.27	308,224	839	4	9	53	21	3	10
POOL-PLUNGE	9	243	20.1	1.65	7,398	17	4	6	22	18	3	47
POOL-STRAIGHT SCOUR	218	7,185	11.7	1.05	117,609	599	3	8	46	20	5	18
POOL-TRENCH	15	598	5.1	2.19	3,107	0	1	0	0	0	0	99
PUDDLED CHANNEL	1	68	5.5	0.45	375	0	20	10	50	20	0	0
RAPID/BEDROCK	32	655	14.4	0.50	12,147	78	10		2	3	2	92
RAPID/BOULDERS	13	134	11.0	0.29	1,501	87	0	0	14	35	41	10
RIFFLE	444	14,404	12.8	0.24	245,197	511	1	3	60	21	3	13
RIFFLE W/ POCKETS	103	4,872	16.7	0.30	96,637	2335	4	6	20	31	18	22
STEP/BEDROCK	10	14	6.1	0.55	97	2	0	0	0	0	0	100
STEP/STRUCTURE	21	24	26.7	0.67'	974	1	2	2	18	6	0	71
Total:	1832	83,995	12.0	0.72	***,***	6085	Avg: 8	12	44	16	4	15

HABITAT SUMMARY

Habitat Group	No. Units	Total Length (m)	Avg Width (m)	Avg Depth (m)	Uetted Area (m^2)	Percent	Large Boulders Number	#/100m^2	Wood Class
Damned & BW Pools	362	14,530	5.9	0.70	151462	10.44	332	0.22	1.9
Scour Pools	562	25,437	12.2	1.21	436338	30.08	1455	0.33	1.5
Glides	280	23,756	15.2	0.75	505090	34.83	1284	0.25	1.3
Riffles	547	19,276	13.5	0.25	341835	23.57	2846	0.83	1.1
Rapids	45	790	13.4	0.44	13648	0.94	165	1.21	1.1
Cascades	1	20	4.5	2.00	88	0.01	0	0.00	1.0
Step/Falls	31	38	20.0	0.63	1071	0.07	3	0.28	1.1
Small Streams (SS)	0	0	.	.	0	0.00	0	0.00	.
Dry	4	149	5.3	0.11	824	0.06	0	0.00	1.5

Table B-2. Stream Summary for the Umatilla River, RM 0.0 to 56.1, June 4, to August 1, 1996.

STREAM SUMMARY — UMATILLA RIVER

Number Units	Total Length (m)	Avg Width (m)	Avg Depth (m)	Total Area (m^2)	Substrate Percent Wetted Area S/O	Sand	Grvl	Cbbl	Bldr	Bdrk	Total Large Boulder
1832	83,995	12.0	0.72	1,450,356	8	12	44	16	4	15	6,085

Habitat Group	Wetted Area (m^2)	Percent
Scour Pool	436,338	30.1
Backwater Pools	151,462	10.4
Glide	505,090	34.8
Riffle	341,835	23.6
Rapid	13,648	0.9
Cascade	88	** *
Step	1,071	0.1
Dry	824	0.1

Table B-3. Valley, Channel, Bank and Wood Summary for the Umatilla River, RM 0.0 to 56.1, June 4, to August 1, 1996.

Valley and Channel Summary

Valley Characteristics (Percent Reach Length)

Narrow Valley Floor		Broad Valley Floor	
Steep V-shape	0	Constraining Terraces	60
Moderate V-shape	0	Multiple Terraces	40
Open V-shape	0	Wide Floodplain	0

Valley Uidth Index avg: 24.4 range: 2.0-200.0

Channel Morphology (Percent Reach Length)

Constrained		Unconstrained	
Hillslope	0	Single Channel	0
Bedrock	0	Multiple Channel	0
Terrace	10	Braided Channel	0
Alt. Terrace/Hill	49		
Landuse	0		

Channel Characteristics

Type	Length	Area	Dry Units
Primary	64,484	***,***	0
Secondary	19,433	141,554	4

Channel Dimensions

Wetted Surface		Active Channel		First Terrace	
Width	13.7	Width	41.2	Width	51.9
Depth	0.72	Height	1.0	Height	1.8
U:D	61.0				

Stream Flow Type: LF Water Temp: 16-O-23.0
Avg. Unit Gradient: 0.4 Habitat Units/100m: 2.2

Riparian, Bank, and Wood Summary

Land Use: UR,RR Riparian Veg.: S,D 15-30

Bank Stability

Bank Class	Percent Reach Length
Non-Erodible	8.2
Vegetation Stabilized	57.2
Boulder-cobble	8.0
Actively Eroding	26.6

Undercut Banks
Unit Average: 7.03%

Open Sky (% of 180)
Unit Average: 77
Range: O-97

Large Woody Debris

Average Complexity Score: 1.4

Pieces	2,304	Volume(m^3)	1,271
Pieces/100m	3.6	Volume/100m	2.0

Table B-4. Riparian Summary for the Umatilla River, RM 0.0 to 56.1, June 4, to August 1, 1996.

Predominant landform in each zone

	Zone 1 O-IO meters	Zone 2 IO-20 meters	Zone 3 20-30 meters
Hillslope	15	15	19
High terrace	35	36	36
Low terrace	47	44	42
Floodplain	0	0	0
Wetland/meadow	0	0	0
Stream channel	1	1	1
Roadbed/Railroad	0	0	0
Riprap	0	0	0
Surface slope (%)	22	11	9

Canopy closure and ground cover

	Zone 1 O-10 meters (%)	Zone 2 10-20 meters (%)	Zone 3 20-30 meters (%)
Canopy closure	32	21	15
Shrub cover	32	27	21
Grass/forb cover	44	51	57

Average number of trees in a S-meter wide band

Diameter class	Zone 1 O-IO meters		Zone 2 IO-20 meters		Zone 3 20-30 meters		Zones 1-3 O-30 meters	
	Conifer	Hardwood	Conifer	Hardwood	Conifer	Hardwood	Conifer	Hardwood
3-15cm (cm)	0.3	1.8	0.1	0.7	** *	0.6	0.4	3.1
IS-30cm	0.3	1.6	0.2	0.9	0.3	q.5	0.7	3.0
30-50cm	0.1	0.9	0.1	0.5	0.1	0.3	0.4	1.6
50-90cm	**.*	**.*	**.*	**.*	** *	**.*	0.1	0.1
>90cm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total/100m^2	0.6	4.3	0.4	2.2	0.5	1.3	0.5	2.6

APPENDIX C
Thermograph Locations and Recorded Temperatures

ble C-l. Thermographs in the Umatilla River.

LOCATION	AGENCY	RIVER MILE	DEPLOYMENT PERIOD	THERMOGRAPH TYPE
Umatilla River (at Three Mile Falls Dam)	CTUIR	3.7	All Year	Temp-Mentor
Umatilla River (at Three Mile Falls Dam)	USBR	3.7	All Year	Hydromet
Umatilla River (at Maxwell Canal at new gage)	USBR	15	All Year	Hydromet
Umatilla River (near Dillon Canal at gage 0310)	USBR	24	All Year	Hydromet
Umatilla River (near Feed Canal at gage 0290)	USBR	28	All Year	Hydromet
Umatilla River (near Yoakum at gage 0260)	USBR	37	All Year	Hydromet
Umatilla River (Near Rieth)	CTUIR	49	Moved to 42.5	RTM2000
Umatilla River (Near Barnhart)	CTUIR	42.5	All Year	RTM2000
Umatilla River (Near Pendleton, at gage 0210)	USBR	55.2	June-Ott	Hydromet
Umatilla River (Near ODFW Office)	CTUIR	56	May-Ott	Temp-Mentor
Umatilla River (Below Meacham Creek)	CTUIR	78.5	Discontinued	Temp-Mentor
Umatilla River (Above Meacham Creek)	CTUIR	79	Discontinued	Temp-Mentor
Umatilla River (at USGS Gage)	CTUIR	81.7	All Year	Temp-Mentor
Umatilla River (Below mouth of N. and S. Forks)	USFS	89.5	Feb.-Dec.	Temp-Mentor
Ryan Creek	CTUIR	1	Aug-Oct	RTM2000
Minthom Springs (Near Umatilla RM 65)	CTUIR	In Springs	All Year	Temp-Mentor
Mission Creek (upper)	CTUIR	3.7	All Year	RTM2000
Mission Creek (lower)	CTUIR	1.25	Aug-Oct	RTM2000
Buckaroo Creek	CTUJR	2	May-Ott	Temp-Mentor
Squaw Creek	CTUJR	2	May-Ott	Temp-Mentor
Little Squaw Creek	CTUJR	0.1	May-Ott	Temp-Mentor
N.Fork Umatilla River	USFS	0.1	June-Oct.	Temp-Mentor
S.Fork Umatilla River	USFS	0.1	Feb.-Dec.	Temp-Mentor
Shimmiehom	USFS	0.1	June-Oct.	Temp-Mentor

Table C-2. Thermographs in Meacham Creek Drainage.

LOCATION	AGENCY	RIVER MILE	DEPLOYMENT PERIOD	THERMOGRAPH TYPE
Meacham Creek	CTUJR	2	Discontinued	Temp-Mentor
Meacham Creek	CTUJR	5.25	May-Ott	Temp-Mentor
Meacham Creek	CTUIR	13	Aug-Oct	RTM2000
Meacham Creek	ODFW	31.5	May-Ott	Temp-Mentor
Meacham Creek	ODFW	32.5	May-Ott	Temp-Mentor
Bonifer Pond (near Meacham C. RM 2.5)	CTUIR	Pond	Feb-May	Temp-Mentor
Camp Creek	CTUJR	0.6	Ott-August	RTM2000
N.F. Meacham	ODFW	0.1	Apr. to Oct.	Hobo
N.F. Meacham	CTUIR	0.2	May-Ott	RTM2000
N.F. Meacham	USFS	2	June-Oct.	Temp-Mentor
East Meacham	CTUJR	0.1	All Year	RTM2000
Butcher Creek	CTUJR	1	Discontinued	RTM2000

ble C-3. Thermographs in Wildhorse Creek Drainage

LOCATION	AGENCY	RIVER MILE	DEPLOYMENT PERIOD	THERMOGRAPH TYPE
Wildhorse Creek (Mouth)	CTUIR	0.1	May-Ott	Temp-Mentor
Wildhorse Creek (Below project)	CTUIR	9.5	All Year	RTM2000
Wildhorse Creek (Near Adams)	ODFW	13	All Year	Temp-Mentor
Wildhorse Creek (Headwaters)	CTUIR	26	May-Ott	Temp-Mentor
Greasewood Creek (Mouth)	CTUIR	0.1	May-Ott	RTM2000
Spring Hollow (Project Area)	CTUIR	3.5	Aug-Oct	RTM2000

Table C-4. Thermographs in the Walla Walla River Basin

LOCATION	AGENCY	RIVER MILE	DEPLOYMENT PERIOD	THERMOGRAPH TYPE
Walla Walla River	CTUIR	8	May-Ott	Temp-Mentor
Walla Walla River	CTUIR	47	May-Ott	Temp-Mentor
S.F. Walla Walla	CTUIR	0.5	Discontinued	RTM2000
S.F. Walla Walla	CTUIR	7	May-Ott	Temp-Mentor
S.F. Walla Walla	CTUIR	20	Jun-Oct	RTM2000
Elbow Creek (S.F. Walla Walla)	ODFW	0.1	April-Dee	HOBO
Burnt Cabin Creek (S.F. Walla Walla)	CTUIR	0.1	Discontinued	RTM2000
Reser Creek (S.F. Walla Walla)	CTUIR	0.1	Discontinued	RTM2000
N.F. Walla Walla	CTUIR	0.1	Discontinued	Temp-Mentor
N.F. Walla Walla	ODFW	6	April-Dee	HOBO
N.F. Walls Walla	ODFW	12	April-Dee	HOBO
Pine Creek	ODFW	20.5	All Year	Temp-Mentor
Pine Creek	ODFW	29	All Year	Temp-Mentor

Table C-S Thermographs in Birch Creek, Butter Creek, and Willow Creek Drainages.

LOCATION	AGENCY	RIVER MILE	DEPLOYMENT PERIOD	THERMOGRAPH TYPE
Birch Creek	ODFW	3.5	All Year	Temp-Mentor
Birch Creek (near Sparks)	ODFW	6.5	All Year	Temp-Mentor
East Birch Creek	ODFW	8.5	All Year	Temp-Mentor
Westgate Canyon (East Birch Creek)	ODFW	0.75	All Year	Temp-Mentor
Pearson Creek	ODFW	4	April-Oct.	Hobo
West Birch Creek	ODFW	2	All Year	Hobo
West Birch Creek	ODFW	IS	All Year	Hobo
Butter Creek	ODFW	51	April-Ott	Hobo
Little Butter Creek (Near Gurdane)	ODFW	7	April-Oct.	Hobo
Little Butter Creek (Near Lena)	ODFW	19.5	April-Ott	Hobo
Willow Creek	ODFW	61	April-Oct.	Hobo
Willow Creek	ODFW	77.5	April-Oct.	Hobo
Rhea Creek	ODFW	16.7	April-Oct.	Hobo
Rhea Creek	ODFW	35	April-Oct.	Hobo

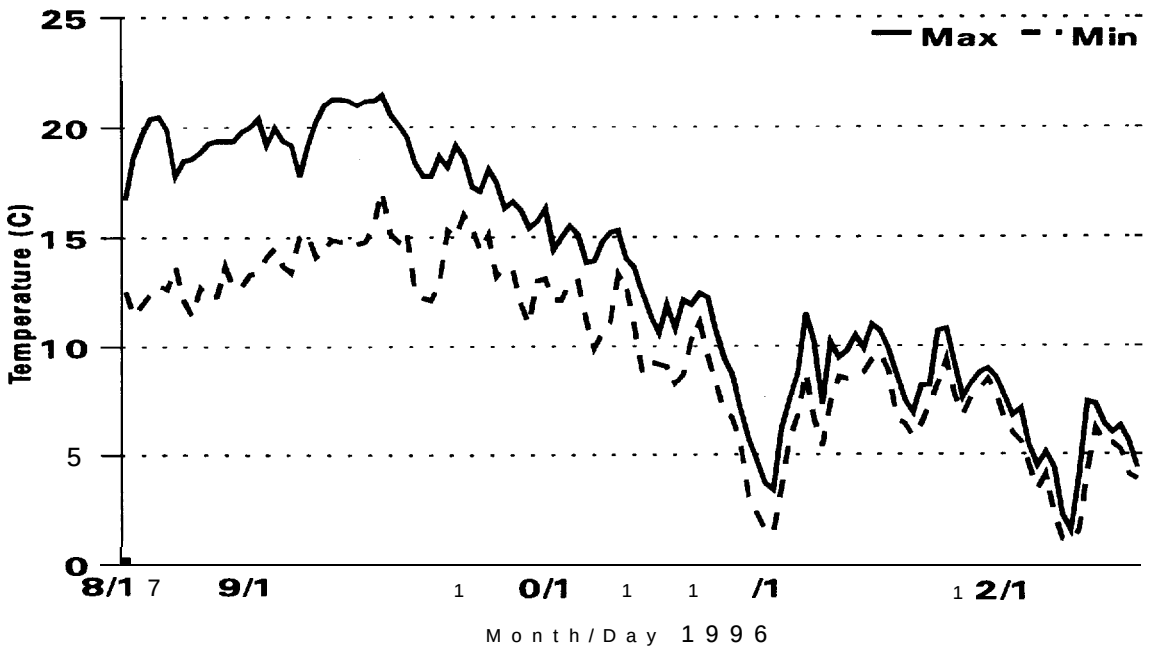


Figure C-l. Maximum and Minimum Temperatures Recorded in the Umatilla River, Near Barnhart, RM 42.5, August 1995 through December 1996 (TGUB9508.CH3).

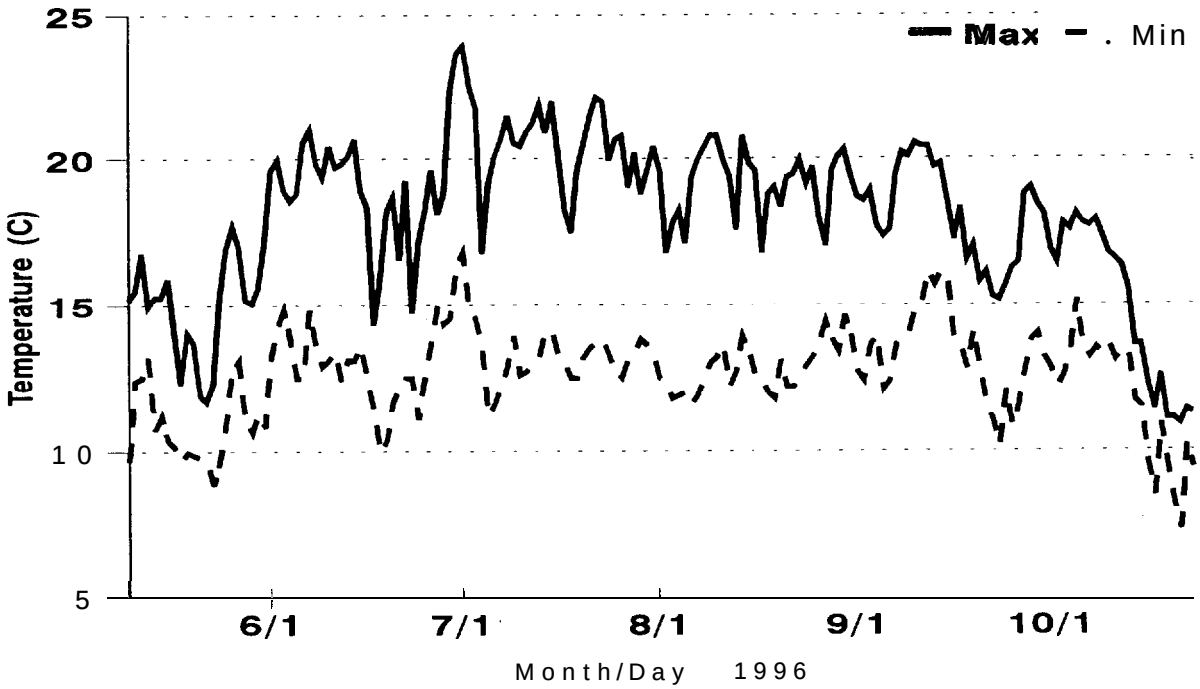


Figure C-2. Maximum and Minimum Temperatures Recorded in the Umatilla River, Near Barnhart, RM 42.5, May Through October 1996 (TCUB9605.CH3).

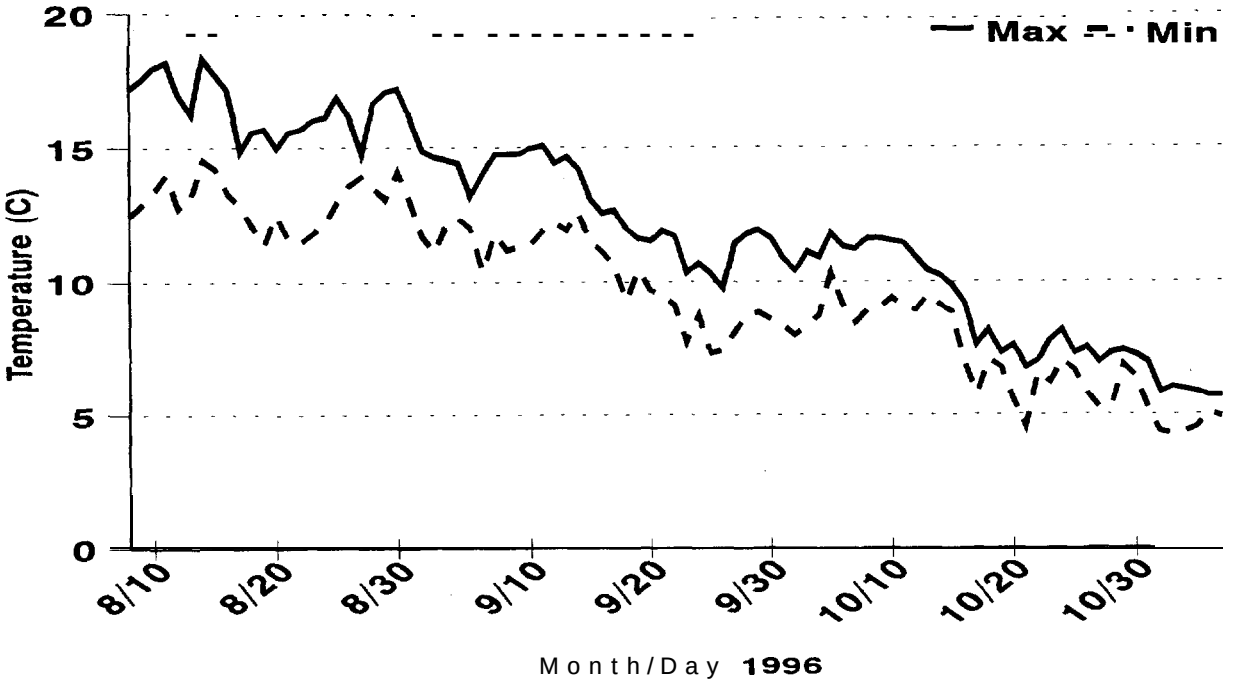


Figure C-3. The Maximum and Minimum Temperatures Recorded in Ryan Creek, RM 1 .0, August through October, 1996 (TGRY9608.CH3).

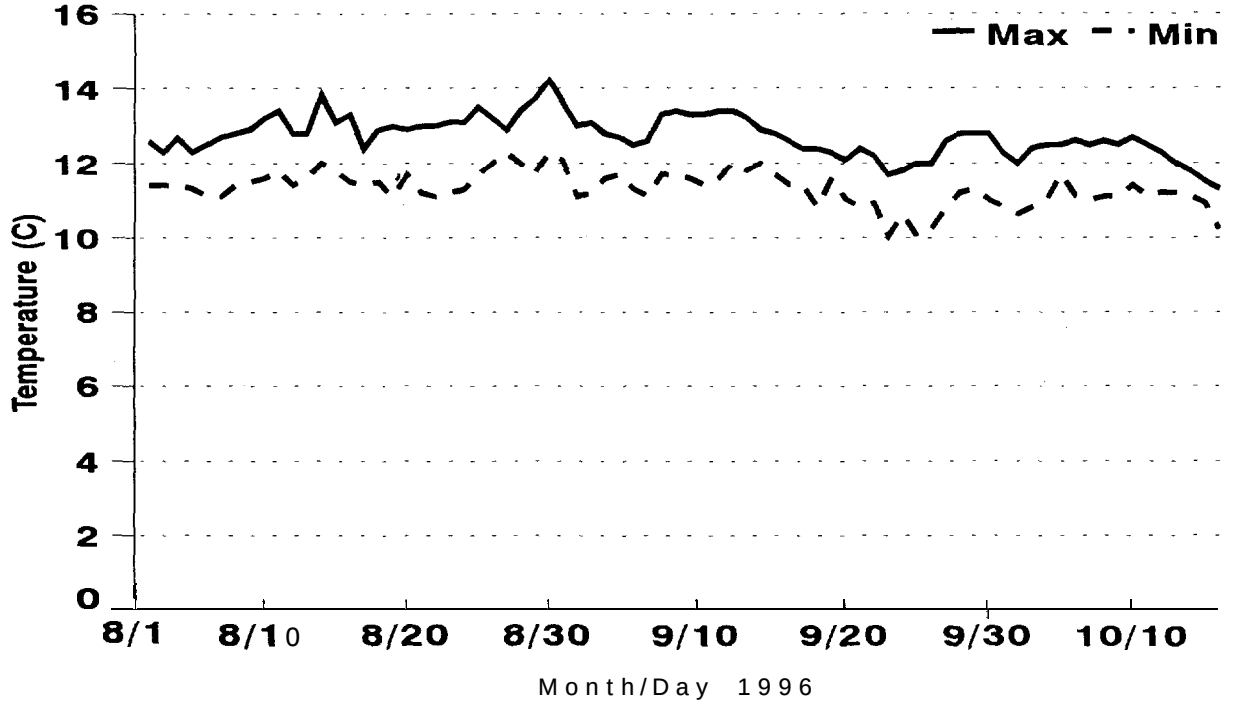


Figure C-4. Maximum and Minimum Temperatures Recorded in Mission Creek, RM 1.25, August, 1996 through October, 1996 (TGML9608.CH3).

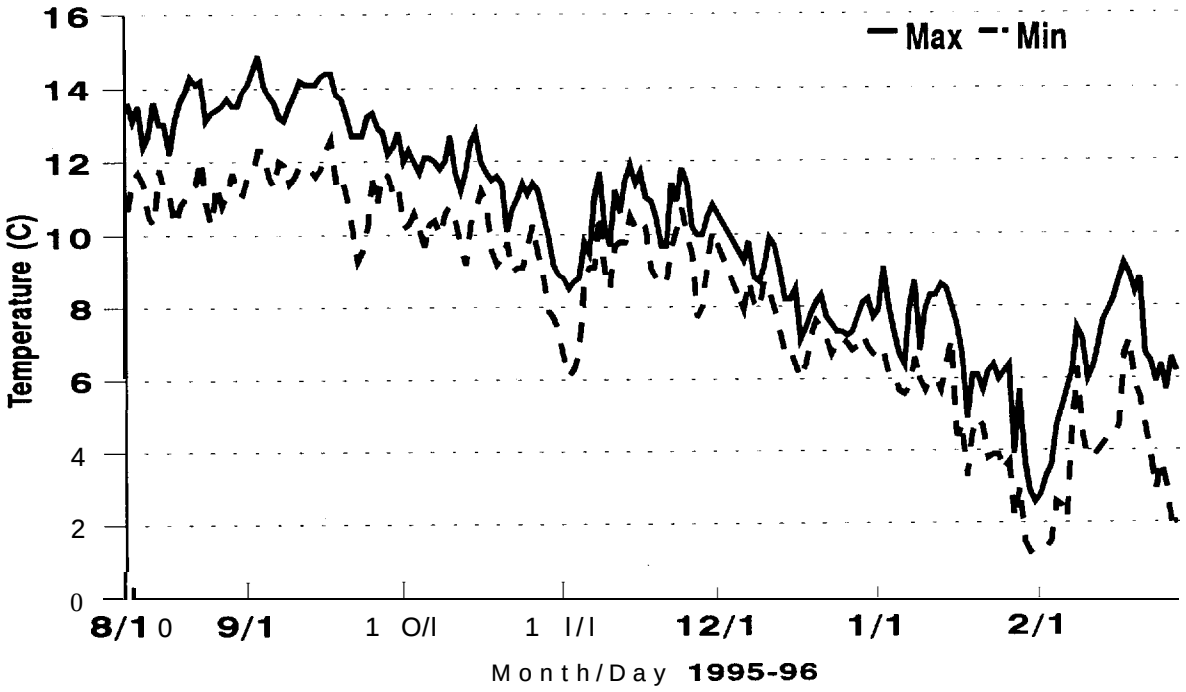


Figure C-S. Maximum and Minimum Temperatures Recorded in Mission Creek, RM 3.7, August, 1995 to February, 1996 (TCMC9508.CH3).

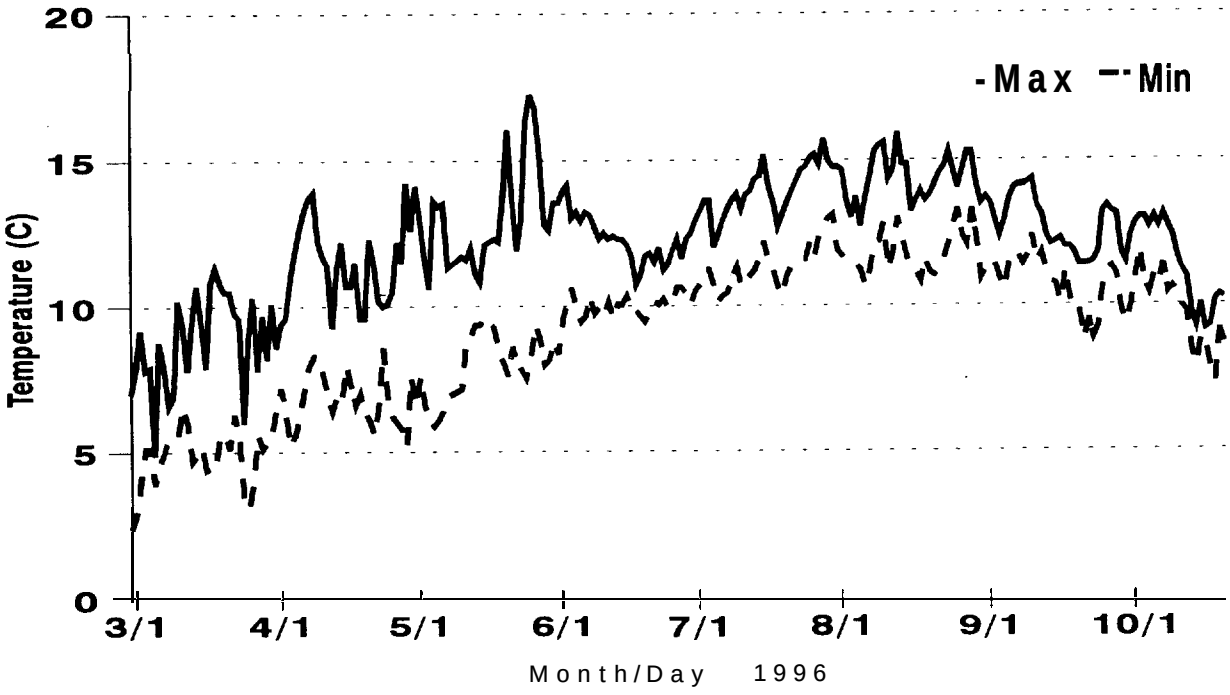


Figure C-6. Maximum and Minimum Temperatures Recorded in Mission Creek, RM 3.7, March through October, 1996 (TCMC9605.CH3).

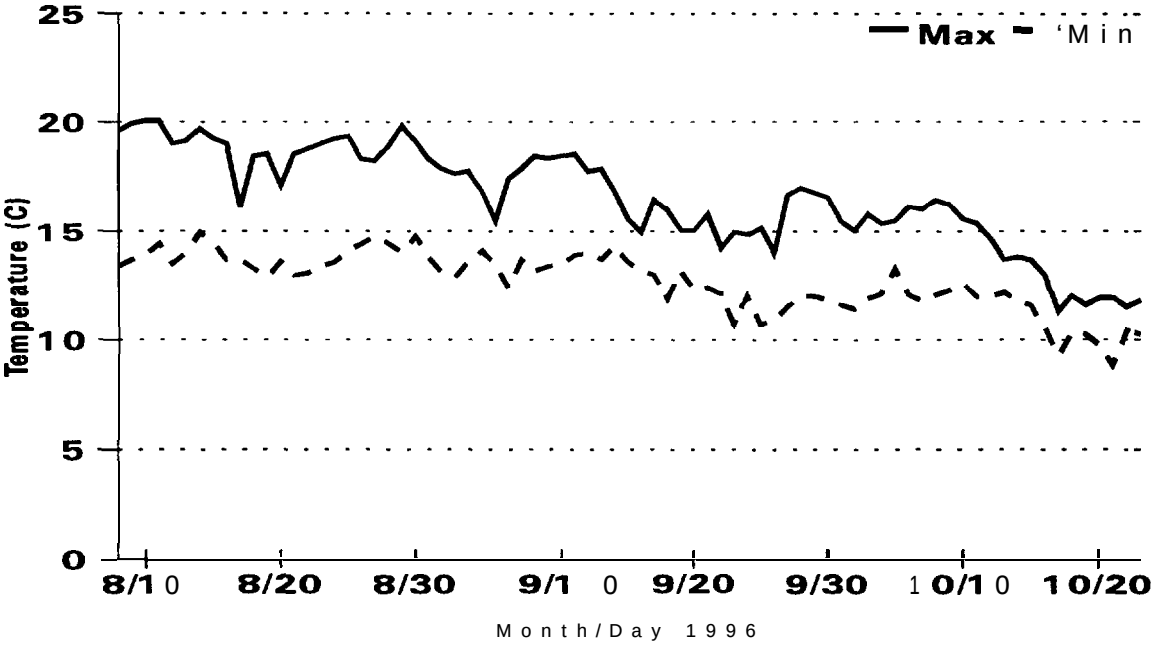


Figure C-7. Maximum and Minimum Temperatures Recorded in Meacham Creek, RM 13, August, 1996 to October, 1996 (TGMM9608.CH3).

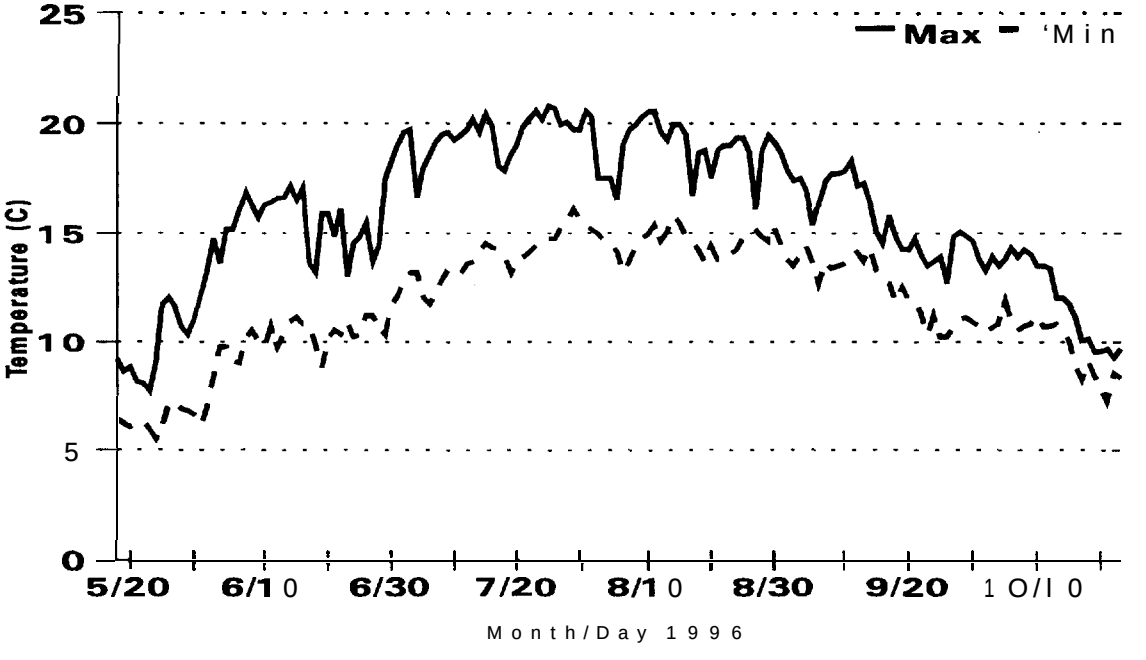


Figure C-8. Maximum and Minimum Temperatures Recorded in North Fork Meacham Creek, RM 0.2, May through October, 1996 (TGMN9605.CH3).

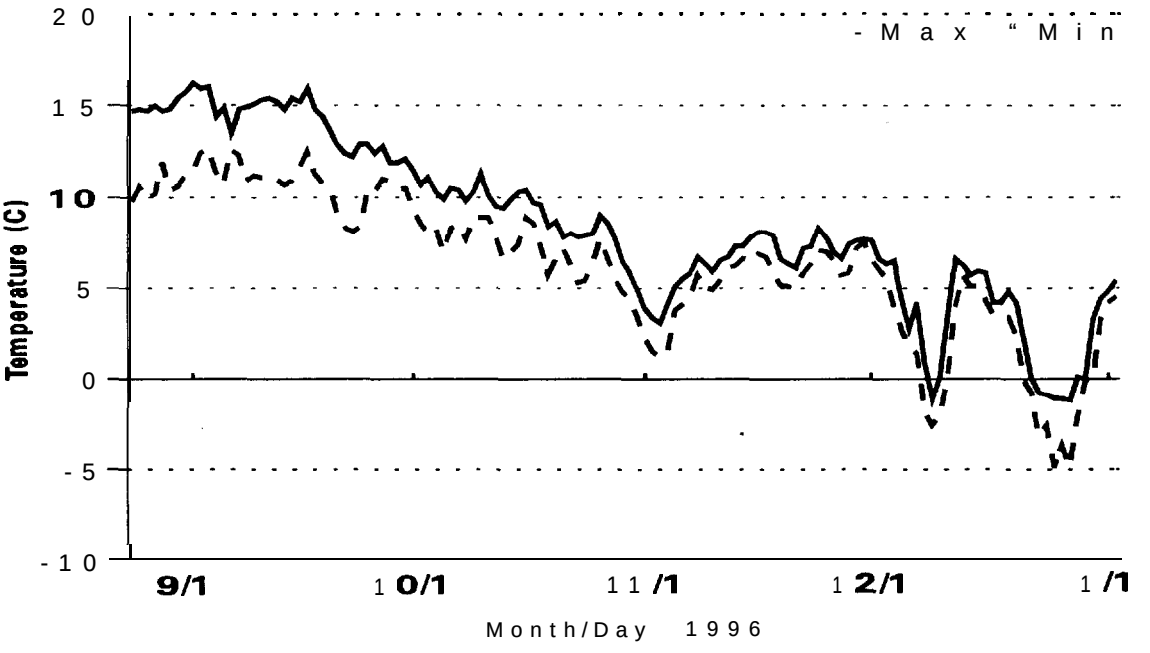


Figure C-9. Maximum and Minimum Temperatures Recorded in Camp Creek, RM 0.5, September, 1995 to January, 1996 (TGCP9508.CH3).

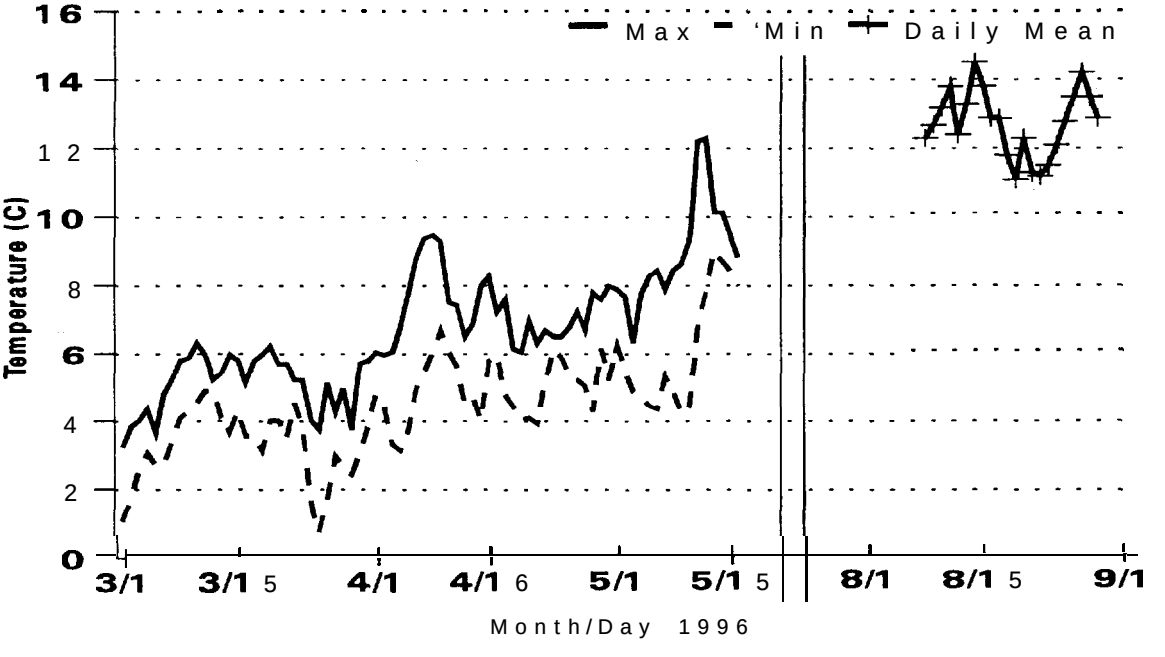


Figure C-10. Maximum and Minimum Temperatures Recorded in Camp Creek, RM 0.6, March through May, 1996, and Daily Mean Temperatures for August 1996 (TCCP9512.CH3).

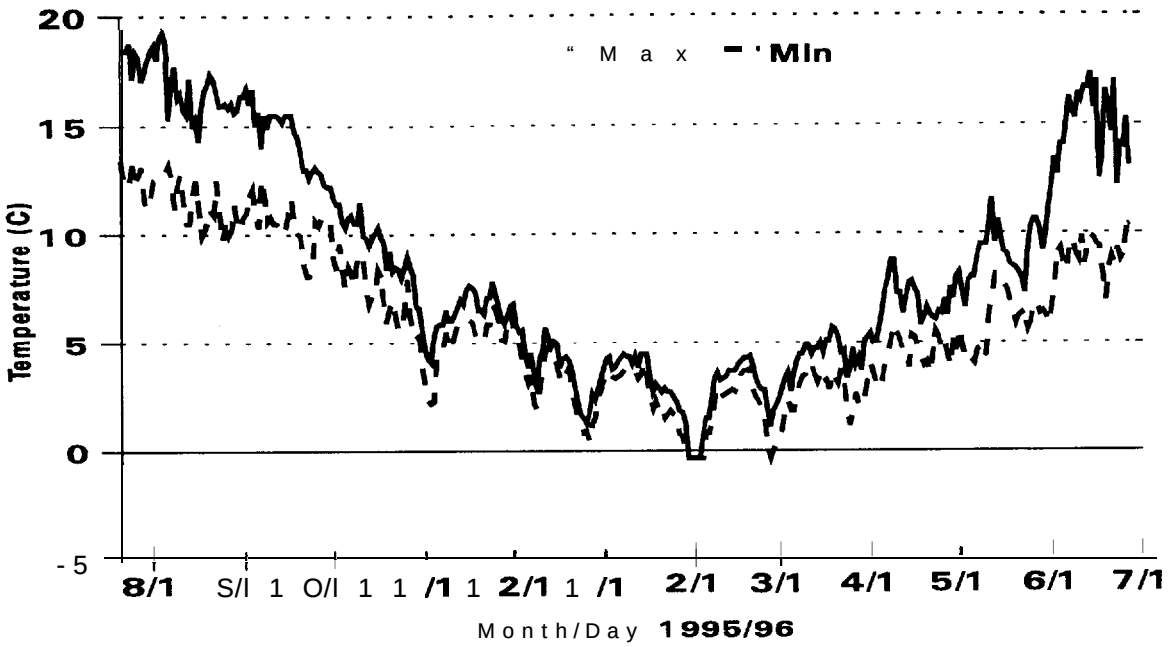


Figure C-l 1. Maximum and Minimum Temperatures Recorded in East Fork Meacham Creek, RM 0.1, August 1995 to July, 1996 (TGMN9507.CH3).

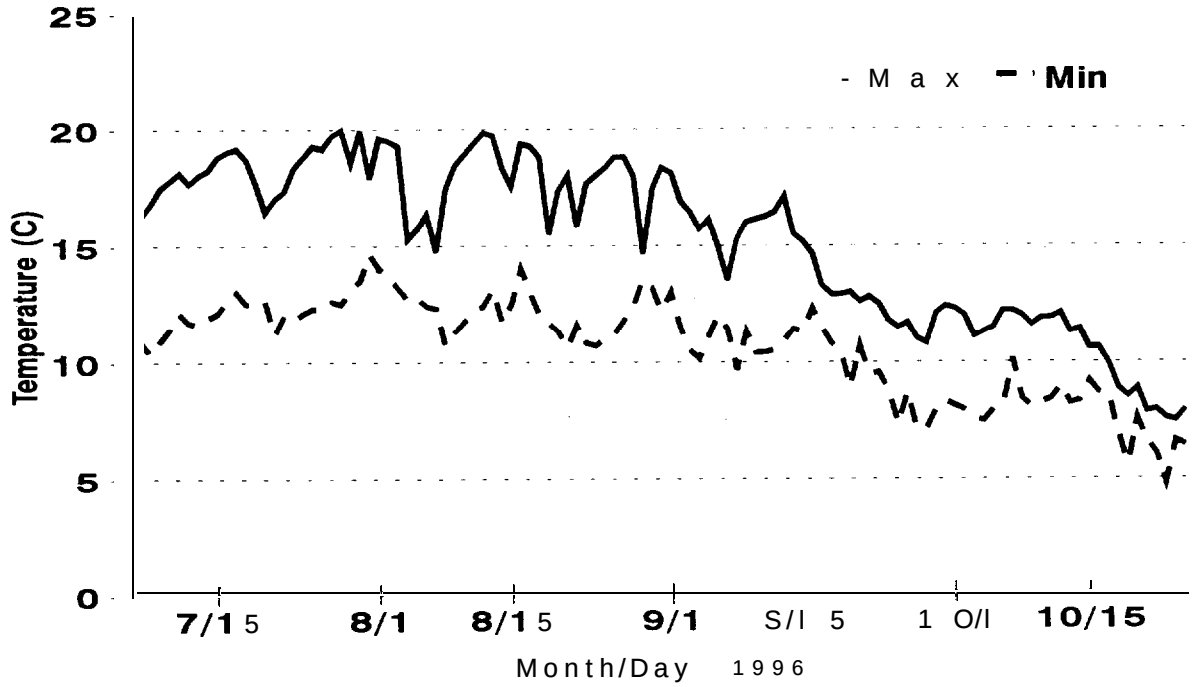


Figure C-12. Maximum and Minimum Temperatures Recorded in East Fork Meacham Creek, RM 0.1, July 1996 through October, 1996 (TCMN9607.CH3).

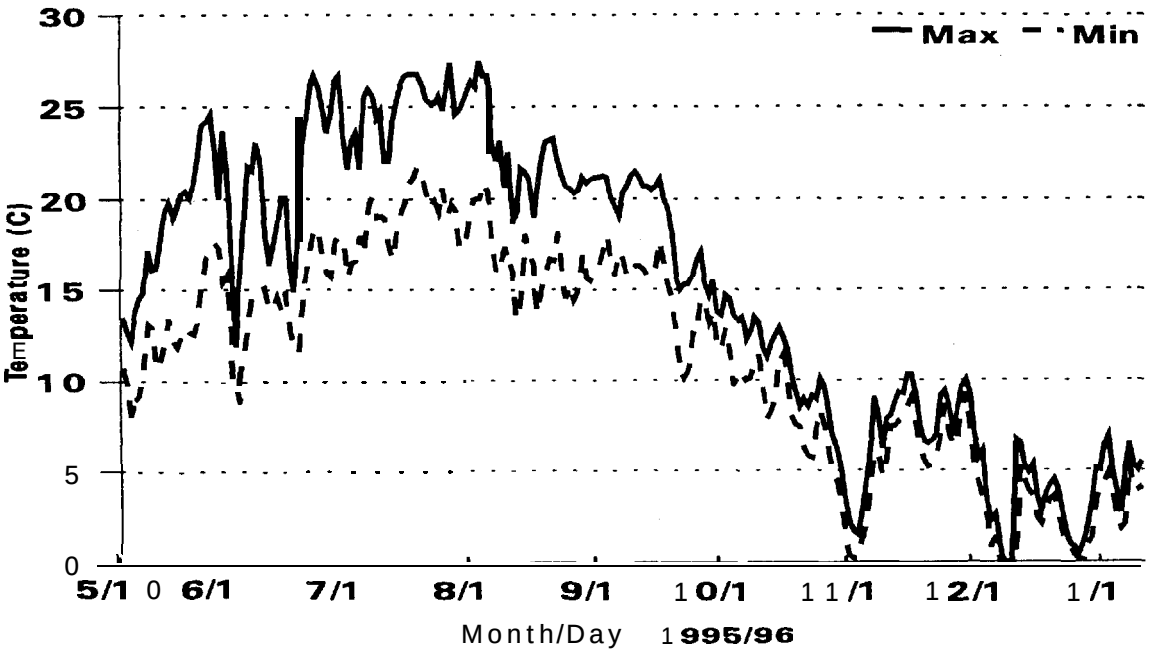


Figure C-13. Maximum and Minimum Temperatures Recorded in Wildhorse Creek, RM 9.5, May, 1995 to January, 1996 (TGWD9505.CH3).

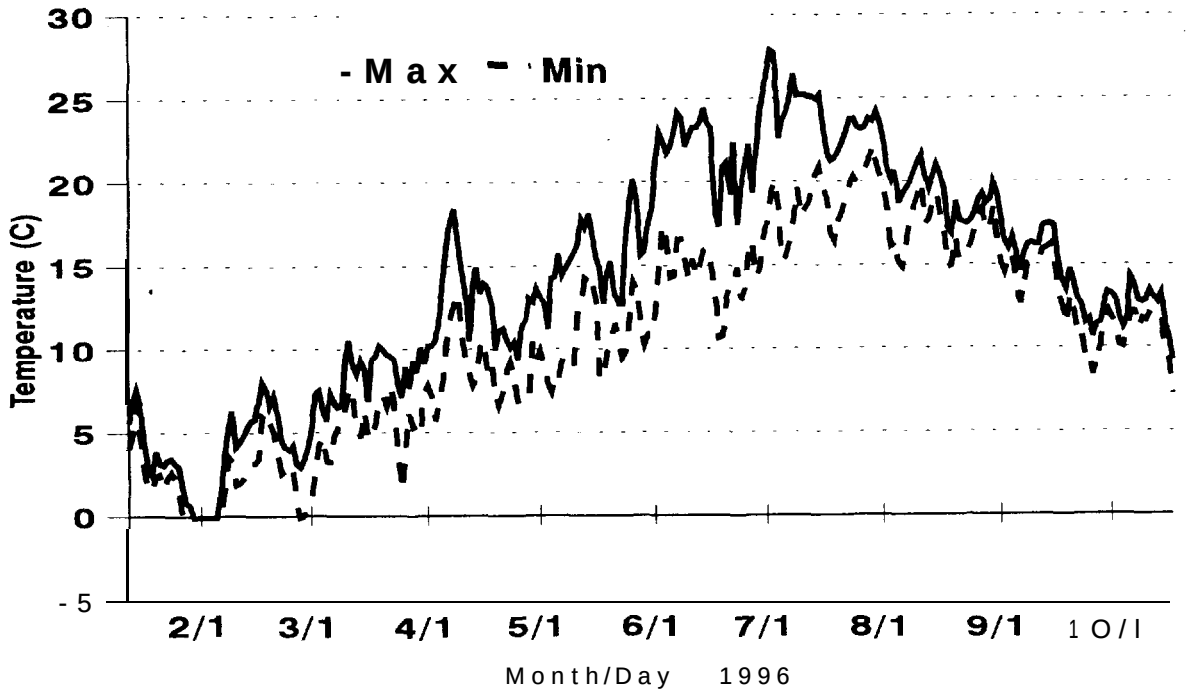


Figure C-14. Maximum and Minimum Temperatures Recorded in Wildhorse Creek, RM 9.5, January 1996 through October, 1996 (TCWD9601 .CH3).

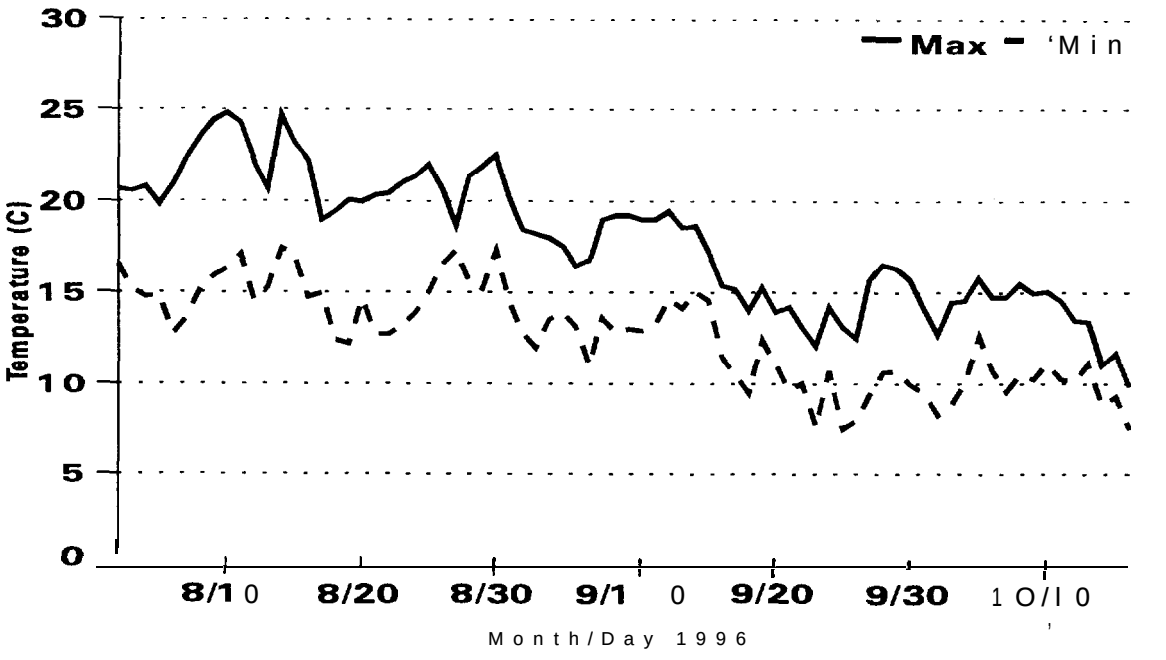


Figure C-15. Maximum and Minimum Temperatures Recorded in Greasewood Creek, RM 0.1, August 1996 through October, 1996 (TGGW9608.CH3).

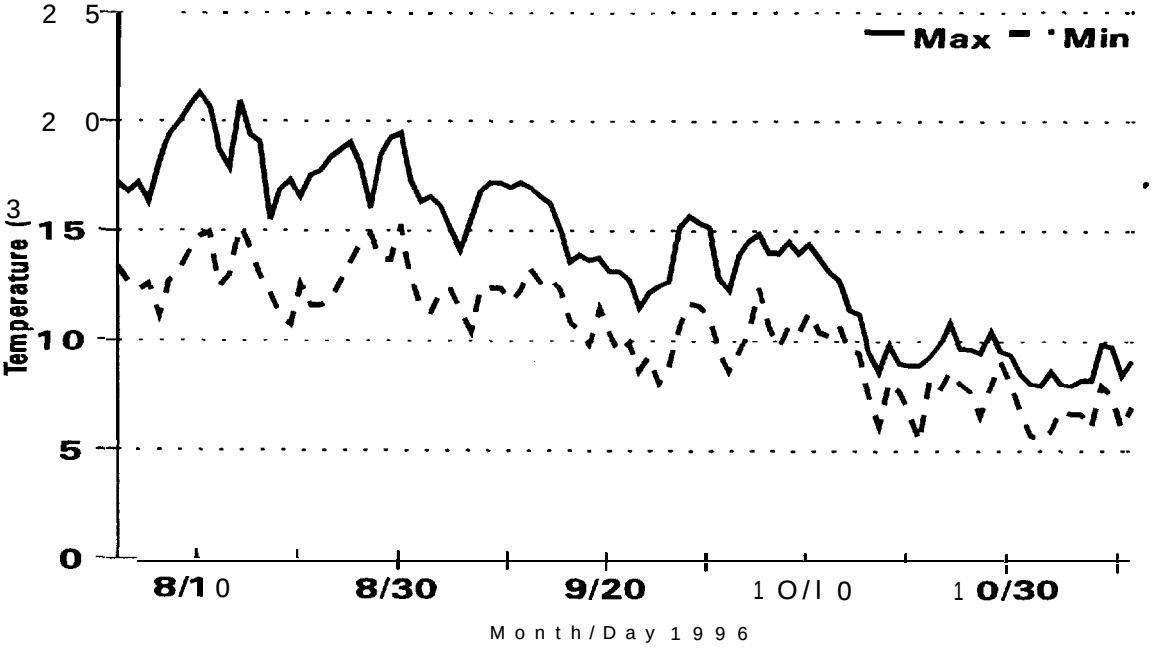


Figure C-16. Maximum and Minimum Temperatures Recorded in Spring Hollow Creek, RM 0.1, July 1996 to November, 1996 (TGSH9608.CH3).

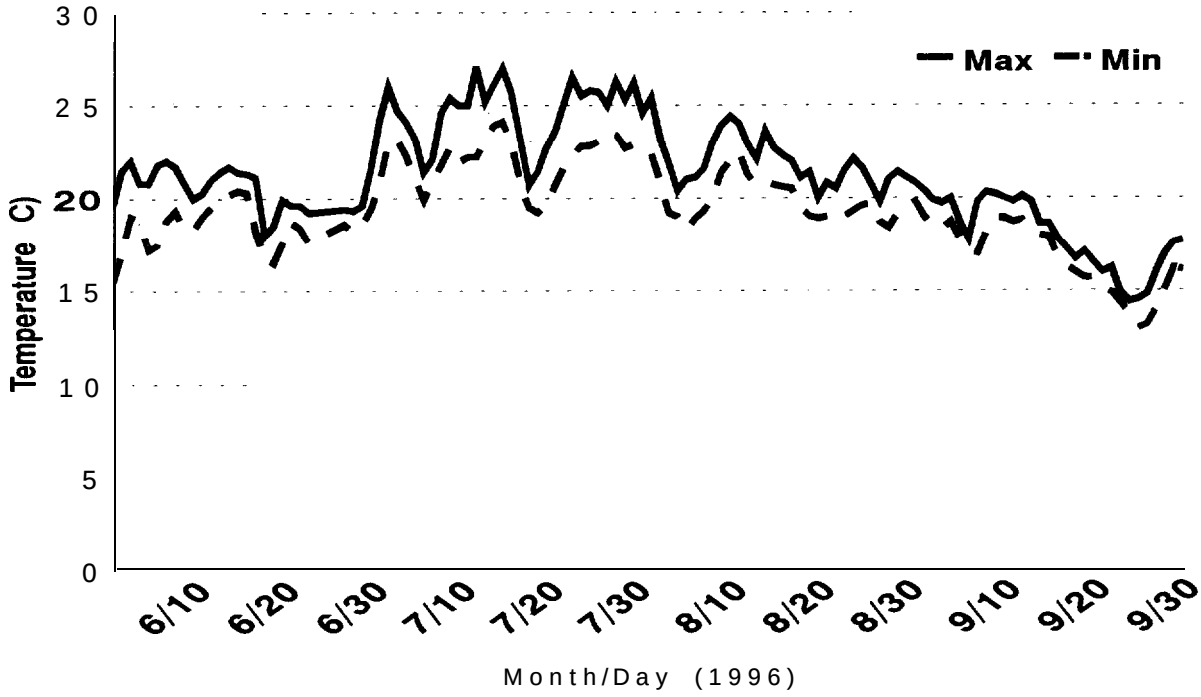


Figure C-17. Maximum and Minimum Temperatures Recorded in the Umatilla River at TMD near RM 4, June through September, 1996 (3MD9606.CH3).

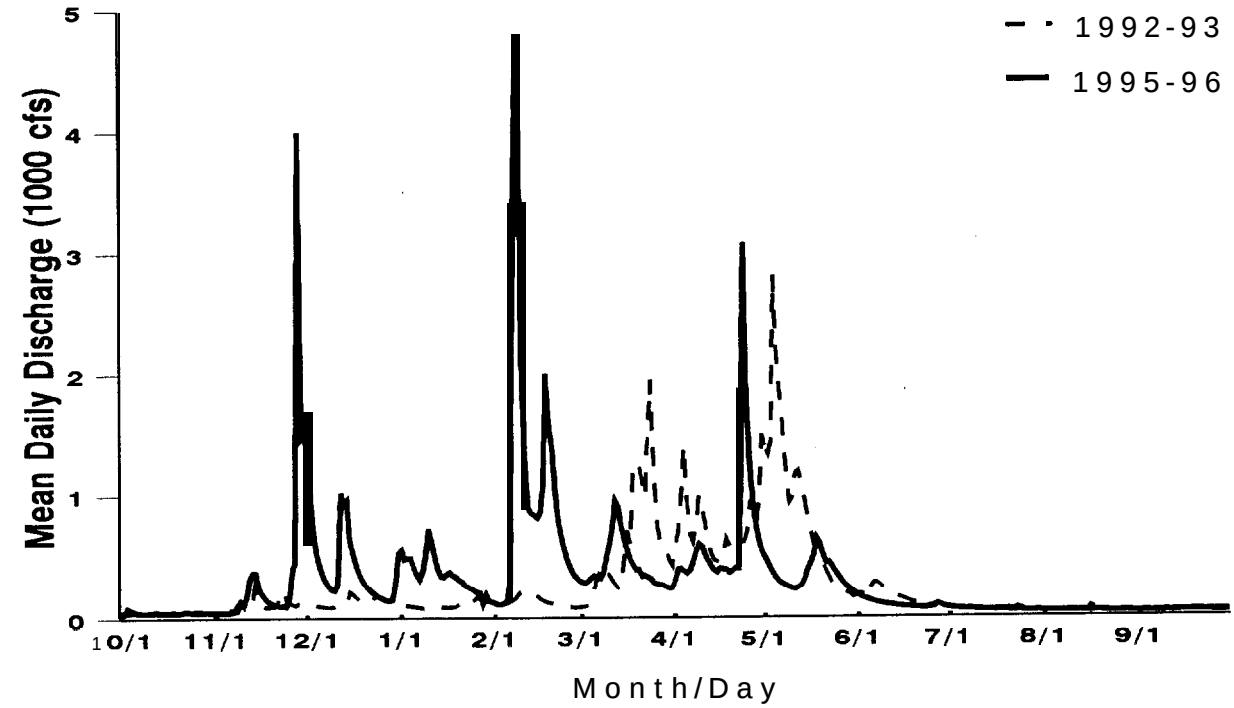


Figure C-18. Mean Daily Flows in the Umatilla River at the Gibbon Gage, RM 83.1, Water Years 1993 (110% mean annual flow) and 1996 (141% mean annual flow; UMDAYFLW.CH3).

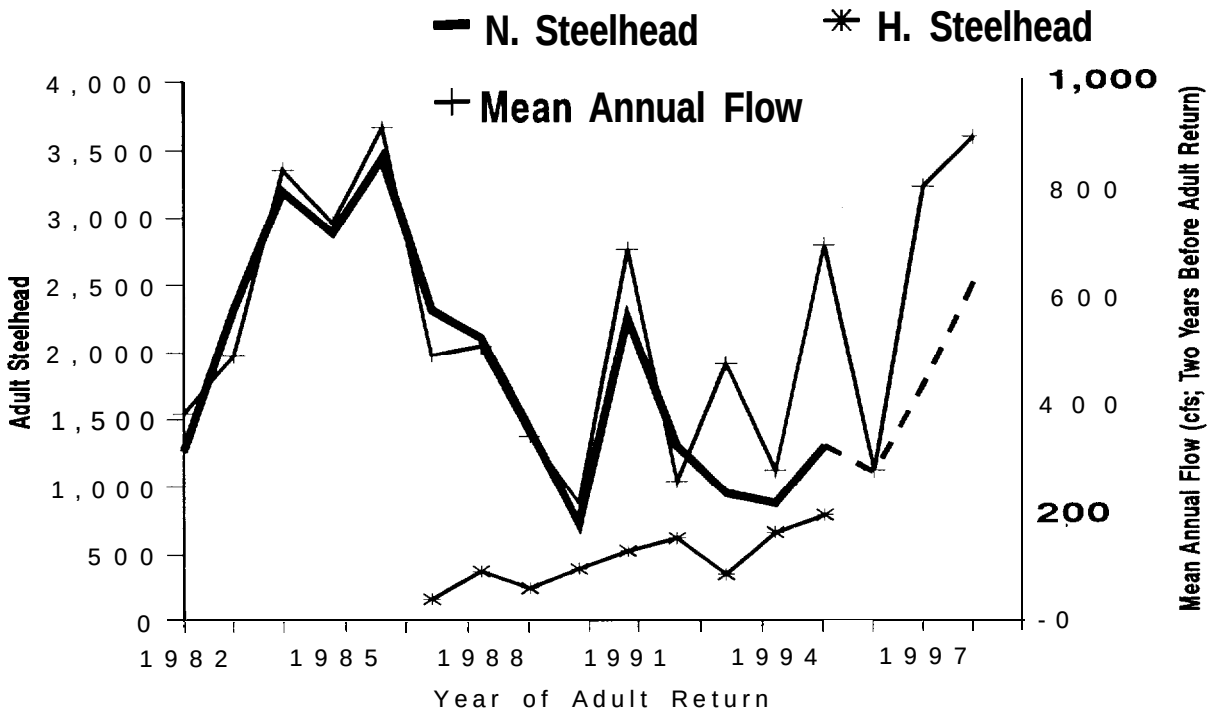


Figure C-19. Adult Steelhead Returns Compared to the Mean Annual Flows (cfs) at Umatilla Gage (RM 1.2) Two Years Prior to the Adult Return from 1982-83 to 1996-97, (1996-97 and 1997-98 adult returns approximated; STSFLWB 1 .CH3).

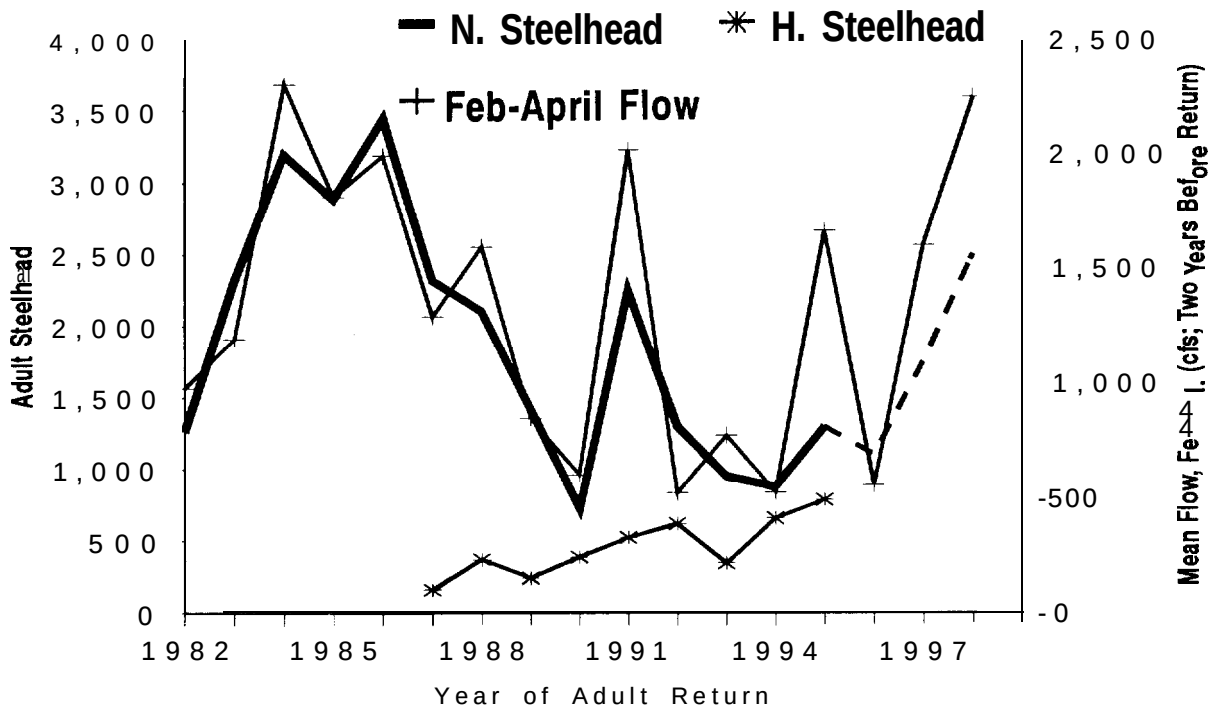


Figure C-20. Adult Steelhead Returns and the Average of February, March and April Mean Monthly Flows (cfs) at Umatilla Gage (RM 1.2) Two Years Prior to the Adult Return from 1982433 to 1996-97 (1996-97 and 1997-98 adult returns approximated; STSFLWB2.CH3).

APPENDIX D
Biological Survey Data Summary Tables

Table D-l. Mean Density and Population Estimate of Naturally Produced Steelhead, Chinook and Coho Salmon, and Mountain Whitefish, Umatilla River, RM 0.0-56.1, 6/12-8/29 1996.

Habitat Type	Number of units	Number of unites Sampled	Percent Sampled	Total Area (m^2)	Area Sampled (m^2)	Percent of Total Area Sampled	Density (Salmonids /100 m^2)	Estimated Salmonid Numbers
POOLS								
Lateral Pool	320	60	18.8	352,293	19,264	5.5	0.140	494
scour Pool	218	3;	20.6	134,390	9,225	6.9	0.206	277
Dammed Pool	23	2	13.0	96,395	1,890	2.0	0.053	51
Trench Pool	15	3	13.3	8,456	444	7.7	0.0	0
Plunge Pool	19		33.3		444	5.3	0.0	0
SUBUNIT POOLS								
Backwater Pool	287	35	15.3	40,099	5,597	13.9	0.368	25
Isolated Pool		22						62
Alcove		0	0.0		0	0.0		0
Ponded	1	0	0.0	9423	0	0.0		0
GLIDES								
Glide	280	19	6.8	577,165	7,271	1.3	0.014	79
Slow Water Subtotals	**1,205**	**189**	**15.7**	**1,249,411**	**51,759**	**4.1**	0.079	988
RIFFLES								
Riffle	444	43	9.7	280,295	17,498	6.2	0.371	1041
Riffle W/ Pockets	103	20	19.4	110,422	4,907	4.4	0.346	383
RAPIDS-CASCADES								
Rapid-Bedrock	32	5	18.8	13,893	2,204	15.9	0.272	38
Rapid-Boulder	13	0	38.5	1,717	499	29.1	0.401	7
Cascade Bedrock	1		0.0	101	0	0.0		
Fast Water Subtotals	593	74	12.5	406,428	25,108	6.2	0.358	1,457
***SPECIAL** CASES*								
Steps	31	0	0.0	1,225	0	0.0		
Dry	3	0	0.0	513	0	0.0		
TOTALS	832	263	14.4	**1,657,577**	76,867	4.6	0.148	2,445

Table D-2. Species Composition and Estimated Densities of Juvenile Salmonids Captured in the Umatilla River from June 12 to August 29, 1996 (RM 0 -56.1).

Juvenile Salmonids	Number Captured	Percent Composition	Density (Salmonids /100 m^2)	Fork Length (mm) Min/Mean/Max
Steelhead	141	88.13	0.130	5011181293
Adult Mountain Whitefish	13	8.12	0.012	267 / 311 / 408
Chinook Salmon	4	2.50	0.004	52 / 78 / 107
Coho Salmon	2	1.25	0.002	80 / 88 / 95
Total	**160**	**100.00**	0.148	

Table D-3. Summary of Non-Salmonids Observed in the Umatilla River from 263 of 1,832 Habitat Units (4.6% by area) from RM 0.0 to 56.1 from June 12 to August 29, 1996.

Species	Number Observed	Percent Composition	Density (/100 m2)	Abundance Estimate	Non-Salmonid to Salmonid Ratio .
Speckled Dace	34,318	46.83	44.65	740,000	213:1
Redside Shiner	24,108	32.90	31.36	520,000	150:1
Sucker	7,266	9.92	9.45	157,000	45:1
Chiselmouth Chub	4,820	6.58	6.27	105,000	30: 1
Northern Squawfish	1,480	2.02	1.93	32,000	9:1
Sculpin	1,202	1.64	1.56	26,000	7:1
Carp	60	0.08	0.08	1,000	
Smallmouth Bass	23	0.03	0.03	500	
Brown Bullhead	2				
Adult Lamprey	1				
Ammocoete	1				
Bluegill	1				
Pumpkinseed	1				
TOTAL	**73,281**	**100.00**	95.33	**1,580,000**	**455:1**

Table D-4. Salmonid Abundance Index Site Summary. Total Site Length, Percent Slow and Fast Water Habitat, Discharge, Number of Salmonids Captured/Minute (Fish/Min), and Mean Catch/Minute.

Site Number	Stream	RM	Date	Length (m)	Percent Slow Water Habitat	Percent Fast Water Habitat	Flow	Fish/Min.	Mean
01	Umatilla R.	1.5	11/28/95	213	62	38	High	0.5	
			03/26/96	213	52	48	Med-High	0.5	0.3
			08/08/96	213	74	26	Low	0.0	
02	Umatilla R.	9.0	11/28/95	152	64	36	Med-High	0.0	
			03/26/96	152	59	41	Medium	0.0	0.0
			08/09/96	152	64	36	Low	0.0	
03	Umatilla R.	25.0	11/28/95	138	33	67	Med-High	0.1	
			03/28/96	138	30	70	Medium	0.1	0.1
			08/08/96	138	62	38	Low	0.1	
04	Umatilla R.	38.0	11/21/95	402	84	16	Medium	0.0	
			03/28/96	402	78	22	Med-High	0.0	
			08/09/96	152	43	57	Med-Low	0.0	0.0
05	Umatilla R.	50.0	11/21/95	148	29	71	Medium	0.1	
			04/02/96	148	14	86	Med-High	0.0	0.1
			08/13/96	148	28	72	Low	0.1	
06	Umatilla R.	60.0	11/16/95	127	21	79	Medium	0.0	
			04/02/96	127	20	80	Med-High	0.4	0.1
			08/07/96	127	13	87	Low	0.0	
07	Umatilla R.	67.5	11/16/95	234	26	74	Medium	0.4	
			04/02/96	234	50	50	Mad-High	0.1	0.3
			08/13/96	234	45	55	Low	0.3	
08	Umatilla R.	74.0	11/27/95	168	46	54	Med-High	0.1	
			04/03/96	168	100	00	Med-High	0.5	0.3
			08/13/96	168	77	23	Low	0.3	
09	Umatilla R.	81.0	11/27/95	70	36	64	Med-High	0.3	
			04/05/96	70	30	70	Medium	3.1	2.3
			08/14/96	70	24	76	Low	3.6	
10	Umatilla R.	88.0	11/30/95	92	61	39	High	2.3	
			04/03/96	92	52	48	Medium	2.4	3.2
			08109196	92	56	44	Med-Low	5.0	

11	North Fork Umatilla River	1.0	11/20/95 04/09/96 08/08/96	37 37 37	35 59 54	65 41 46	Med-High Med-High Med-Low	0.5 1.5 6.9	4.1
12	North Fork Umatilla River	3.0.	11/20/95 04/09/96 08/08/96	41 41 41	32 34 22	68 66 78	Medium Med-High Med-Low	1.1 1.2 2.2	1.5
13	South Fork Umatilla River	1.0	04/04/96 08/02/96	76 76	50 08	50 92	-- Medium Medium	– 2.2 3.4	2.8
14	South Fork Umatilla River	4.0	11/13/95 04/04/96 08/13/96	47 47 47	21 23 51	79 77 49	High Medium Low	4.0 0.6 7.7	4.1
15	Birch Creek	5.5	11/21/95 03/28/96 08/07/96	94 94 94	32 0 62	68 loo 38	Medium Medium Low	0.1 0.1 0.0	0.1
16	Birch Creek	10.0	11/14/95 03/28/96 08/07/96	77 77 77	30 23 23	70 77 77	Medium Medium Low	0.0 0.3 0.2	0.2
17	West Birch Creek	2.0	11/14/95 03/15/96 08/06/96	49 49 49	76 59 59	24 41 41	Medium Medium Med-Low	0.2 0.0 0.2	0.1
18	West Birch Creek	10.5	11/14/95 03/08/96 08/05/96	33 33 33	0 9 24 0	91 76 100	Medium Med-High Low	0.3 1.0 3.3	1.2
19	East Birch Creek	4.5	11/14/95 03/08/96 08/07/96	45 45 45	07 42 42	93 58 58	Medium Medium Low	0.3 0.0 4.0	1.4
20	East Birch Creek	13.0	11/14/95 03/08/96 08/06/96	18 18 18	72 55 55	28 45 45	Med-Low Medium Low	4.9 0.0 3.9	2.9
21	Bear Creek	1.0	11/15/95 03/15/96	29 29	59 34	41 66	Med-Low Medium	0.2 0.0	0.1
22	Bear Creek	4.5	11/15/95	77	44	56	Med-Low	5.0	5.0
23	Bridge Creek	1.0	11/14/95 03/08/96 08/05/96	33 33 33	24 00 00	76 100 100	Mad-LOW Medium Low	0.8 0.8 1.2	0.9
24	Pearson Creek	2.0	11/14/95 03/08/96 08/06/96	21 21 21	43 00 00	57 100 1 0 0	Medium Medium Law	4.4 0.9 6.0	3.8
2s	Buckaroo Creek	1.0	11/08/95 03/19/96 08/09/96	17 17 17	47 0 100	53 100 0	Low Med-Low Low	1.5 2.0 3.2	2.2
26	Squaw creek	2.5	11/08/95 03/19/96 08/09/96	57 57 57	19 88 84	81 12 16	Low Med-Low Low	4.2 0.4 6.6	3.7
27	Squaw Creek	7.0	11/30/95 03/19/96 08115196	71 71 71	13 14 51	87 86 49	Med-High Med-Low Low	2.3 1.3 3.5	2.3
28	Boston Canyon creek	0.6	11/13/95 03/21/96 08/05/96	27 27 27	26 15 15	74 85 85	Medium Med-Low Low	3.3 0.6 9.8	4.6

29	Line Creek	0.5	11/13/95 03/21/96 08/05/96	14 14 14	29 71 71	71 29 29	Medium Med-Low Low	2.7 4.1 1.9	2.9
30	Meacham Creek	9.0	11/29/95 03/25/96 08/14/96	76 76 76	0 0 0	100 100 100	High Low Low	0.4 1.0 0.6	0.7
31	Camp Creek	0.6	11/13/95 03/21/96 08/15/96	46 46 46	33 37 43	67 63 57	Medium Medium Low	3.1 1.4 2.6	2.4
32	North Fork Meacham Creek	0.5	11/29/95 03/25/96 08/16/96	80 80 80	55 41 68	45 67 32	High Low Low	1.7 0.3 2.3	1.4
33	North Fork Meacham Creek	1.2	03/25/96 08/16/96	64 64	45 53	55 47	Low Low	0.6 0.7	0.6
34	Meacham Creek	17.0	11129195 03/21/96 08/14/96	79 79 79	28 63 57	72 37 43	High Medium law	0.7 0.8 1.7	1.1
3s	East Meacham Creek	0.3	03/21/96 08116196	42 42	45 55	55 45	Medium Low	1.9 0.8	1.4
36	Meacham Creek	28.5	11/29/95 03/25/96 08/14/96	38 38 38	42 45 42	58 55 58	High Med-Low Low	0.0 0.0 6.4	2.1
37	Ryan Creek	1.0	11/16/95 04/11196 08/15/96	51 51 51	20 0 0	80 100 loo	Medium Med-Low Low	5.1 2.4 2.4	3.3
38	Thomas Creek	2.5	11/08/95 04/03/96	20 20	20 15	80 85	Low Medium	0.0 0.4	0.2
39	Spring Creek	0.2	11/08/95 04/03/96 08/07/96	23 23 23	30 30 65	70 70 35	Low Med-High Low	3.5 0.0 7.2	3.6
40	Shiiiehom Creek	0.5	04/04/96 08/13/96	42 42	07 40	93 60	Medium Low	2.1 7.2	4.6

APPENDIX E
Emigrant Trapping Tables and Figures

Table E-l. Summary of Trap Catch Data from the Barnhart, Tumla and Imeques Traps sites, 1994195; Expanded Migration Estimates Include Days the Traps were not Operated within the Trapping Dates.

	TRAPS		
	IMEQUES (RM 79.5)	**BARNHART (RM 42.2)**	**MEACHAM (RM 1.5)**
Trapping Dates	09/07/95 to 06/09/96	10/10/95 to 11/22/95	05/08/96 to 06/06/96
Trapping days over total days	1591276	41 / 44	24 / 29
Natural Chinook			
Number Captured	2,135	42	1
Number Marked and Released	1,888	35	1
Total Number Recaptured	1,089	10	0
Average % Recaptured	57.7%	28.6%	
Expanded Migration Estimate	6,188	184	
Mean Fork Length (mm)	94.2	106	64
Number Measured	1,931	37	1
Sample Standard Deviation	7.89	12.03	
Average % Containment	9 5 %		
Number of containment trials	9	0	
Natural Rainbow/Steelhead			
Number Captured	3,765	37	449
Number Marked and Released	3,002	28	438
Total Number Recaptured	862	4	62
Average % Recaptured	28.7%	14%	14.2%
Expanded Migration Estimate	28,214	259	3,172
Mean Fork Length (mm)	105	124.8	101
Number Measured	3589	34	449
Sample Standard Deviation	31.9	39.67	22.20
Average % Containment	85%		62.5
Number of containment trials	15	0	2

CONTINUED ON THE FOLLOWING PAGE

TABLE E-l CONTINUED	TRAPS		
	IMEQUES (RM 76.5)	BARNHART (RM 42.2)	MEACHAM (RM 1.5)
Natural Coho Captured	1	0	0
Fork Length (mm)	52		
Hatchery Chinook Captured	803	0	0
Marked and Released	483		
Recaptured	64	-	
Average % Recaptured	13.3%		
Expanded Migration Estimate	12,348		
Mean Fork Length (mm)	85.9		
Number Measured	434		
Standard Deviation or Range	16.4		
Hatchery STS Captured	3	0	117
Marked and Released	3		117
Recaptured	0	-	13
Average % Recaptured		-	11.1%
Expanded Migration Estimate		-	1,054
Mean Fork Length (mm)	185	-	193
Number Measured	2	-	117
Sample Standard Deviation			19.1
Hatchery Coho Captured	0	0	0
Bull Trout	11	0	0
Mean Fork Length (mm)	271		
Range (mm)	222-320		
Whitefish	401	0	0
Marked and Released	358		
Recaptured	60	-	-
Average % Recaptured	16.7		-
Mean Fork Length (mm)	213	-	-
Number Measured	355	-	-
Sample Standard Deviation	64.1	-	
Redside Shiner	3663	540	120
Sucker	293	119	17
Dace	5303	201	189
Sculpin	253	14	33
Squawfish	426	45	5
Chiselmouth	43	110	0
Yellow Perch	0	1	0
Crappie	1	6	0
Bass	0	2	0

Table E-2 Summary of Branded Salmonids Recaptured at the Barnhart Trap (RM 42.6). Lower Rotary Trap (R 1.2) and TMD (RM 3). November 1995 through May 1996.

Recapture Date	Species	Length	Clip	Brand	Recapture Location	Branding Period/Dates	Trap Site where Branded	Total Number Branded with that Code (Same Species)
11/10/95	CH	102	AD	7T,RD,1	RM 42.5	10/06-15/95	lmeques	303
11110195	CH	96	AU	7T,R?,1	RM 42.5	10/06-31/95	Imeques	710
11/11/95	CH	100	AU	7T,R?,1	RM 42.5	10/06-31/95	Imeques	710
11/16/95	CH	95	ABC	7U,RD,1	RM 42.5	11/01-15/95	Imeques	562
11/16/95	CH	102	AD	7U,RD,1	RM 42.5	11/01-15/95	Imeques	562
11/20/95	CH	110	ABC	7T,RA,1	RM 42.5	10/16-31/95	Imeques	710
11/21/95	CH	107	AD	7T,RD,1	RM 42.5	10/06-15/95	Imeques	303
11/22/95	CH	98	AD	7T,RA,1	RM 42.5	11/01-15/95	Imeques	710
03/20/96	CH			7U,RD,1	RM 1.2	11/01-15/95	Imeques	562
03/21/96	CH			7U,RD,1	RM 1.2	11/01-15/95	Imeques	562
04/07/96	CH			7U,RD,1	RM 3	1 l/01-15/95	Imeques	562
04/07/96	CH			7U,RD,1	RM 3	11/01-15/95	Imeques	562
05/03/96	CH			7U,RD,1	RM 3	11/01-15/95	Imeques	562
04/02/96	CH			7K,RA,1	RM 3	12/19/95-01/	Imeques	72
04/06/96	CH			7K,RA,1	RM 3	02/96	Imeques	72
04/02/96	CH			7T,RA,1	RM 3	12/19/95-01/	Imeques	710
04/02/96	CH			7T.RA.l	RM 3	02/96	Imeques	710
04/02/96	CH			7T.RA.1	RM 3	10/16-31/95	Imeques	710
04/07/96	CH			7U,RA,2	RM 3	10/16-31/95	Barnhart	27
04/07/96	CH			7K,RD,1	RM 3	10/16-31/95	Imeques	75
04/17/96	CH			7K,RD,1	RM 3	1 l/16-22/95	Imeques	75
05/06/96	CH			7K,RD,1	RM 3	12/10-12/95	Imeques	75
04/02/96	CH			7T,RD,1	RM 3	12/10-12/95	Imeques	303
04/02/96	CH			7T,RD,1	RM 3	12/10-12/95	Imeques	303
04/02/96	CH			7T,RD,1	RM 3	10/06-15/95	Imeques	303
04/15/96	CH			L,RD,1	RM 3	10/06-15/95	Imeques	10
04/08/96	STS			7K,RA,1	RM 3	10/06-15/95	Imeques	136
04/09/96	STS			7U,RA,2	RM 3	01/03-10/96	Barnhart	22
05/04/96	STS			7K,LA,1	RM 3	12/19/95-01/	Imeques	61
05/06/96	STS			7K,LA,1	RM 3	02/96	Imeques	61
05/14/96	STS			7K.LA,1	RM 3	11/16-22/96	Imeques	61
05/30/96	STS			7K,LA,1	RM 3	04/02-30/96	Imeques	61
05/16/96	STS			7N,LA,1	RM 3	04/02-30/96	Imeques	28
05/27/96	STS			7N,LA,1	RM 3	04/02-30/96	Imeques	28
						04/02-30/96		
						05/01/96		
						05/01/96		

Table E-3. Summary of Branded Salmonids Recaptured at the Lower Rotary Trap (RT 1.2) and TMD (RM 3)., November 1995 through May 1996

Released Location Brand Code	Species	Number Branded and Released	Minthom (eat*) Mortalities	Number Recaptured	Percent Recapture Rate
Umatilla Trap					
7T,RD,1	CH	303		3	0.99
	STS	98		0	
7T,RA,1	CH	710	14 (3)	3	0.43
	STS	97	1	0	
7U,RD,1	CH	562	33 (5)	5	0.95
	STS	714	103 (7)	0	
7U.RA.1	CH	42	1	0	
	STS	122		0	
7K,RD,1	CH	75	3	3	4.17
	STS	278	34 (3)	0	
7K,RA,1	CH	72		2	2.78
	STS	136		1	0.74
L,RD,1	CH	10		1	10.00
	STS	15		0	
7U,LA,2	STS	6		0	
	CH	1		0	
7K,LA,1	STS	61		4	6.56
7N,LA,1	STS	28		2	7.14
7N,LA,3	STS	5		0	
7N,LA,4	STS	16		0	
Meacham Trap					
7N,LD,4	STS	18		0	
Barnhart Trap					
7U,RD,2	CH	1		0	
	STS	2		0	
7U,RA,2	CH	27		1	3.70
	STS	22		1	4.55

Species Total	Total Branded	Minthom Morts.	Total Number Examined	Total Recaptured (Lower River)	Percent of Catch Marked	Migration Ratio **	Brand Retention Rate ***	Estimate of Total Migration
CH	1.803	51	240	18	7.5	1	0.64	14,900
STS	1,618	138	5.295	8	0.151	0.16	0.62	100,500

* Mortalities (in parentheses) too decomposed to identify were arbitrarily assigned by species and brand code in proportion to known mortalities.
** Migration ratio = one minus the estimated residualization rate (residuals were branded steelhead that remained in fresh water another summer).
*** Brand retention ratio assumed that one third of the poor brands would not be observed at recapture.

Table E-4. Brand Retention Data from Juvenile Steelhead and Chinook Salmon Held at Minthorn Springs Facility and examined montly from 12/15/95 thrugh 04/23/96 by CTUIR and ODFW staff.

NUMBER OF BRANDS BY CODE AND QUALITY							PERCENTAGE OF BRANDS BY CODE AND QUALITY						
Brand	Quality	12/15	01117	02/15	03/12	04/23	Brand	Quality	12/15	01117	02/15	03/12	04/23
Chinook							Chinook						
RA-7T	G	45	55	33	46	46	RA-7T	G	76	71	46	70	52
	P	14	22	38	20	42		P	24	29	54	30	48
RA-7u	G	7	11	4	6	2	RA-7u	G	100	92	57	60	29
	P	0	1	3	4	5		P	0	8	43	40	71
RD-7K	G	0	25	24	22	5	RD-7K	G	0	83	100	100	26
	P	0	5	0	0	14		P	0	17	0	0	74
RD-7T	G	101	0	2	4	0	RD-7T	G	94	0	33	50	0
	P	6	0	4	4	1		P	6	0	67	50	100
RD-7u	G	57	130	42	57	5	RD-7U	G	100	78	25	36	4
	P	0	36	125	99	115		P	0	22	75	64	96
Unknown	U	2	2	2	5	41	Unknown	U					
Chinook Combined Totals	G	210	221	105	135	58	Chinook Combined Totals	G	90	77	38	50	21
	P	20	64	170	127	177		P	9	22	60	48	64
	U	2	2	2	5	41		U	1	1	1	2	15
Steelhead							Steelhead						
RA-7K	G	0	2	0	0	0	RA-7K	G		100			
	P	0	0	0	0	0		P		0			
RA-7T	G	0	0	1	0	0	RA-7T	G	0		100	0	
	P	1	0	0	1	0		P	100		0	100	
RA-7U	G	0	0	0	0	0	RA-7u	G		0			
	P	0	1	0	0	0		P		100			
RD-7K	G	0	85	83	55	28	RD-7K	G		97	100	81	80
	P	0	3	0	13	7		P		3	0	19	20
RD-7Y	G	179	104	71	13	11	RD-7Y	G	90	53	39	9	14
	P	19	92	113	139	66		P	10	47	61	91	86
Unknown	U	1	1	5	2	29	Unknown	U					
Steelhead Combined Totals	G	179	191	155	68	39	Steelhead Combined Totals	G	89.5	66.3	57	30	28
	P	20	96	113	153	73		P	10	33.3	41	69	52
	U	1	1	5	2	29		U	0.5	0.3	2	1	20

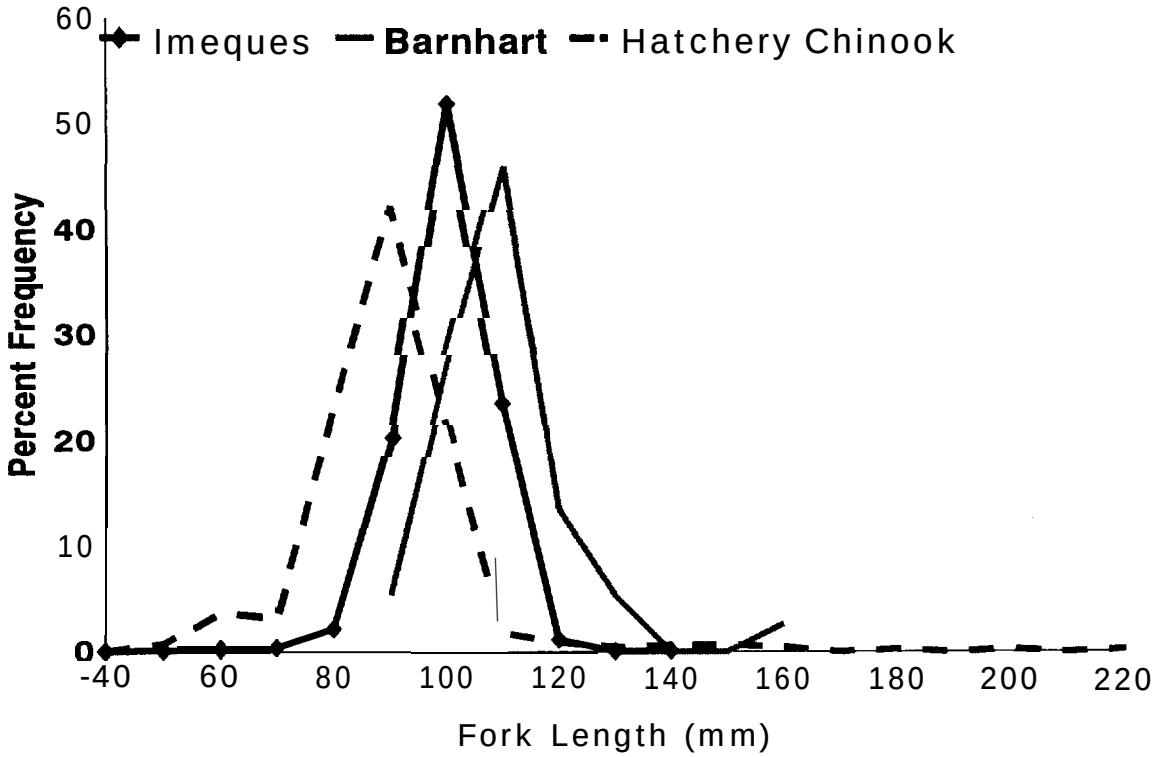


Figure E-l. Length Frequencies of Juvenile Natural and Hatchery Chinook Salmon Captured in the Rotary Screw Traps in the Imeques Trap (RM 79.5, natural chinook n= 1931, hatchery n=434) and from September 9, 1995 to June 9, 1996 and the Bamhart Trap (RM 42.2, natural chinook n=37) from October 10 to November 22, 1995.

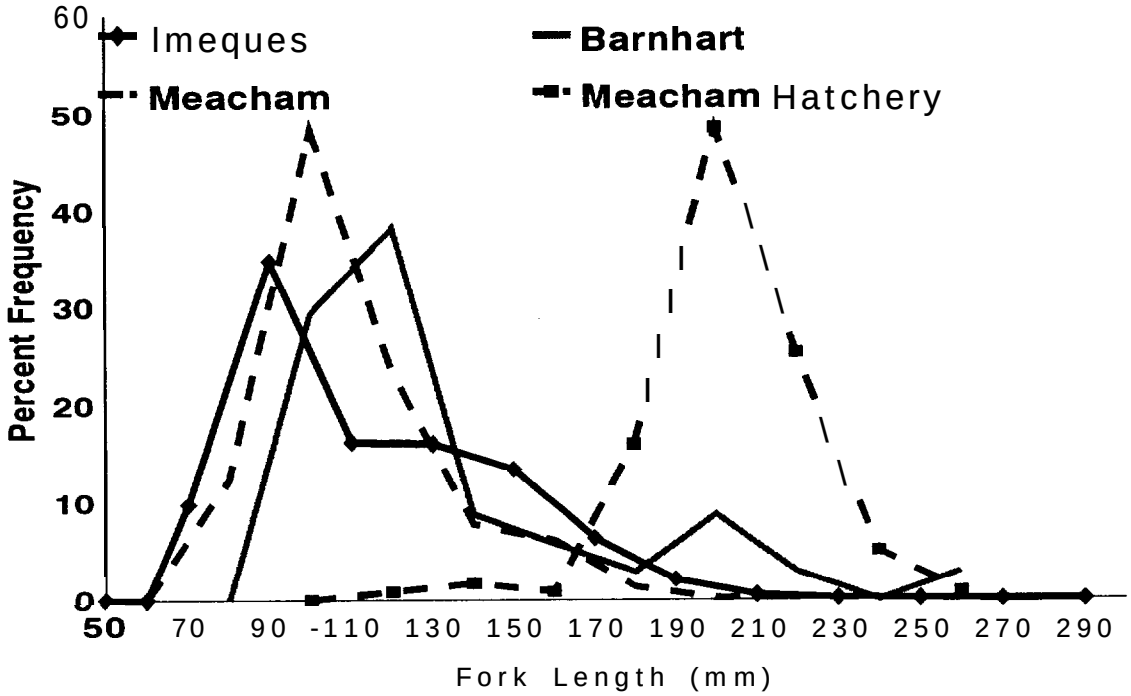


Figure E-2. Length Frequencies of Juvenile Natural and Hatchery Summer Steelhead Captured in the Rotary Screw Traps in the Imeques Trap (RM 79.5, natural n=3589) from September 7, 1995 to June 9, 1996, Barnhart Trap (RM 42.2, natural n=34) from October 10, to November 22, 1995, and Meacham Trap (RM 1.5 natural n=449, hatchery n= 117; XTRAP\956\STSLGT.CH3).

APPENDIX F
Age and Growth Tables

Table F-l. Age Summary by Sex of the Umatilla River Natural Summer Steelhead Broodstock, 1996.

	Age	1.1	1.2	2.1	2.2	3.1	3.2	Total
Female	n	0	0	16	7	1	1	25
	%	0	0	64.0	28.0	4.0	4.0	100
Male	n	0	0	12	1	6	0	19
	%	0	0	63.1	5.3	31.6	0	100
Total	n	0	0	28	8	7	1	44
	%	0	0	63.6	18.2	15.9	2.3	100

Table F-2. Brood Years by Sex of the Umatilla River Natural Summer Steelhead Broodstock, 1996.

	Brood Year	1992	1991	1990	Total
Female	n	16	8	1	25
	%	64.0	32.0	4.0	100
Male	n	12	7	0	19
	%	63.2	36.8	0.0	100
Total	n	28	15	1	44
	%	63.6	34.1	2.3	100

Table F-3. Freshwater Age by Sex of the Umatilla River Natural Summer Steelhead Broodstock, 1996.

	Age	1	2	3	Total
Female	n	0	23	2	25
	%	0	92.0	8	100
Male	n	0	13	6	19
	%	0	68.4	31.6	100
Total	n	0	36	8	44
	%	0	81.1	18.2	100

Table F-4. Age Summary of Umatilla River Natural Summer Steelhead Broodstock, 1994-96.

Brood Year	Age	1.1	1.2	2.1	2.2	3.1	3.2	Total
1994		0	2	24	26	5	6	63
	5	0	3.2	38.1	41.3	1.9	9.5	100
1995	n	0	0	19	17	9	11	56
	%	0	0	33.9	30.4	16.1	19.6	100
1996	n	0	0	28	8	7	1	44
	%	0	0	63.6	18.2	15.9	2.3	100

Table F-5. Freshwater Age Summary of Umatilla River Natural Summer Steelhead Broodstock, 1994-96.

Brood Year	Freshwater Age	1	2	3	Total
1994	n	0	2	24	63
	%	0	3.2	38.1	100
1995	n	0	0	19	56
	%	0	0	33.9	100
1996	n	0	0	28	44
	%	0	0	63.6	100

Table F-6. Freshwater Age Summary of Umatilla River Natural Summer Steelhead Broodstock, 1994-96.

Brood Year	Ocean Age	1	2	Total
1994	n %	29 46.0	34 54.0	63 100
1995	n %	28 50.0	28 50.0	56 100
1996	 3	35 79.5	9 20.5	44 100

Table F-7. Length and Ages of Natural and Hatchery Summer Steelbead Broodstock, 1996.

Age	Length Range (MEHP, mm)	Mean Length (MEHP, mm)	n =	Origin
1.1	450-545	498	15	Hatchery
2.1	450-575	507	28	Natural
3.1	475-573	532	7	Natural
1.2	554-613	589	5	Hatchery
2.2	540-704	627	8	Natural

Table F-8. Ages and Lengths of Juvenile Summer Steelhead Sampled in the Umatilla River from the mouth to RM 51.0, June 12 to August 29, 1996. Age Estimation of the Total Catch Based on Age and Lengths.

Age	n =	Length Range (mm)	Mean Length (mm)	S.D.	Age Estimation by Length	Percent of Total Catch
0	24	51-103	81.8	14.5	1260	58.9
1	19	105-200	147.8	29.0	562	26.2
2	7	160-225	178.3	24.2	319	14.9

Table F-9. Ages and Lengths of Juvenile Summer Steelhead Sampled in the Umatilla River from the mouth to RM 51 .O, June 12 to August 29, 1996.

Age	n =	Length Range (mm)	Mean Length (mm)	S.D.
o+	0			
1+	4	113-125	117	4.56
2+	308	115-241	171	20.66
3+	55	148-295	205	31.8
4+	1		266	

Table G – 1. Summary of Summer Steelhead Escapement Surveys, Umatilla River Basin, 1996.

Redd #	River Mile	Description of Area	Habitat Type	Date Observed	Total Steelhead on Redds that Date	Total Steelhead Holding that Date
CAMP CREEK-MOUTH TO FORKS						
Dates Surveyed: March 21, April 2, 22, May 2						
1	.8	300 yards above red cabin	tailout	4122		
2	1.7	100 yards below my usual survey ending point	riffle	3/22	3	2
3	2.0	600 yards above last redd	tailout	3/22		
4	2.0	75 yards below next redd	riffle	4/22		
5	2.2	mile 2.2	riffle	4/2		1
6	2.3	300 yards below forks	tailout	4/22	2	
7	2.5	50 yards below forks	tailout	5/2		
NORTH FORK– MEACHAM CREEK–MOUTH TO POT CREEK (5.0 miles)						
Dates Surveyed: March 25, April 18, May 3						
8	.0	75 yards above confluence	riffle	4/18	4	2
9	.1	200 yards above confluence	tailout	3/25		
10	.1	150 yards below trailer	tailout	4/18		
11	.2	75 yards below trailer	tailout	4/18		
12	.2	75 yards above trailer	–	4/18		
13	.2	400 yards above confluence	–	3/25		
14	.4	700 yards above confluence	–	4/18		
15	.4	700 yards above confluence	–	4/18		
16	.5	900 yards above mouth	–	4/18		
17	[illegible]	[illegible]	–	[illegible]		
18	.4 miles below Rattlesnake Creek		–	3/25		
19	.9	200 yards below Rattlesnake Creek	riffle	4/18		
20	.9	160 yards below Rattlesnake Creek	tailout	4/18		
21	.9	160 yards below Rattlesnake Creek	tailout	4/18		
22	1.1	200 yards above Rattlesnake Creek	riffle	4/18		
23	1.9	mile 1.9 above mouth	riffle	3/25		
24	2.0	mile 2.0 above mouth	riffle	3/25		
25	2.2	mile 2.2 above mouth	riffle	4/18		
26	2.4	mile 2.4 above mouth	riffle	4/18		
27	2.8	.2 miles below Bear Creek	riffle	3/25		
28	2.8	.2 miles below Bear Creek	riffle	4/18		
29	2.8	.2 miles below Bear Creek	riffle	3/26		
30	2.9	100 yards below Bear Creek	riffle	3/26		
31	2.9	100 yards below Bear Creek	riffle	4/18		
32	3.2	.2 miles above Bear Creek	riffle	4/18		
33	3.8	.8 miles above Bear Creek	tailout	3/25		
34	3.8	.8 miles above Bear Creek	tailout	4/18		
35	3.8	.8 miles above Bear Creek	tailout	4/18		
36	4.0	1.0 miles above Bear Creek	riffle	4/18		
37	4.0	1.0 miles above Bear Creek	riffle	4/18		
SOUTH FORK- UMATILLA RIVER-MOUTH TO 1.0 MILES ABOVE SHIMMIEHORN CREEK						
Date Surveyed: March 27						
38	.1	150 yards above mouth	riffle	3/27	2	1
39	1.5	1.5 miles above mouth	riffle	3/27		
40	1.8	1.8 miles above mouth	riffle	3/27		
MEACHAM CREEK-MOUTH TO 18.2 MILES UPSTREAM						
Dates Surveyed: Incidentally observed–water too high throughout survey period						
41	9.8	Just below RR Bridge at Camp Creek	tailout	3/21	2	
42	9.8	Just below RR Bridge at Camp Creek	tailout	4/22		
43	9.8	Just below RR Bridge at Camp Creek	tailout	4/22		
44	18.5	100 feet below East Fork of Meacham Creek	riffle	4/15		
45	18.5	100 feet below East Fork of Meacham Creek	riffle	4/15		
46	18.5	200 feet below East Fork of Meacham Creek	riffle	4/15		

Table G-I. Continued

Redd #	River Mile	Description of Area	Habitat Type	Date Observed	Total Steelhead on Redds that Date	Total Steelhead Holding that Date
BOSTON CANYON CREEK– MOUTH TO FORKS						
Dates Surveyed: March 13,29 May 1						
				3/13		3
47	.1	50 yards above upper habitat structure	riffle	5/1	1	0
48	.3	600 yards above mouth– still visible	tailout	3/29	3	0
49	.4	740 yards above mouth	tailout	3/29		
50	.5	800 yards above mouth	riffle	5/1		
51	.5	900 yards above mouth	tailout	5/1		
52	.5	930 yards above mouth	riffle	5/1		
53	.7	1200 yards above mouth	riffle	3/29		
54	.8	1450 yards above mouth	tailout	3/29		
55	.9	1600 yards above mouth	riffle	5/1		
MINTHORN SPRINGS CREEK						
Date Surveyed: April 2						
56	.2	125 yards below outlet	riffle	4/2	2	3
57	.3	10 yards below outlet	tailout	4/2		
SQUAW **CREEK–MOUTH** TO **LITTLE** SQUAW CREEK (6.7 miles)						
Dates Surveyed: March 1*, 18, 28, April 5, 17						
58	.0	30 yards above mouth	riffle	3/28	3	2
59	.2	mile .2 above mouth	riffle	4/17	1	
60	.4	mile .4 above mouth	tailout	4117		
61	.4	mile .4 above mouth	tailout	3/18	6	4
62	.5	mile .5 above mouth	tailout	4/5	5	
63	.6	mile .6 above mouth	riffle	3/18		
64	.7	mile .7 above mouth	tailout	3/18		
65	.7	mile .7 above mouth	tailout	3/18		
66	.7	mile .7 above mouth	tailout	3/18		
67	.7	mile .7 above mouth	tailout	3/28		
68	1.0	mile 1.0 above mouth	tailout	3/28		
69	1.0	mile 1.0 above mouth	riffle	3/28		
70	1.0	mile 1.0 above mouth	riffle	3/28		
71	1.1	mile 1.1 above mouth	riffle	3/28		
72	1.1	mile 1.1 above mouth	riffle	4/5		
73	1.4	mile 1.4 above mouth	riffle	4/5		
74	1.4	mile 1.4 above mouth	tailout	3/28		
75	1.4	mile 1.4 above mouth	tailout	3/28		
76	1.4	mile 1.4 above mouth	riffle	4/5		
77	1.4	mile 1.4 above mouth	tailout	4/5		
78	1.4	mile 1.4 above mouth	riffle	4/5		
79	1.6	mile 1.6 above mouth	tailout	4/17		
80	1.6	mile 1.6 above mouth	tailout	4/5		
81	1.9	mile 1.9 above mouth	riffle	3/28		
82	1.9	mile 1.9 above mouth	tailout	4/17		
83	1.9	mile 1.9 above mouth	tailout	4/17		
84	1.9	mile 1.9 above mouth	tailout	415		
85	1.9	mile 1.9 above mouth	tailwt	4/5		
86	1.9	mile 1.9 above mouth	riffle	3/28		
87	1.9	mile 1.9 above mouth	tailout	4/17		
88	1.9	mile 1.9 above mouth	riffle	3/28		
89	1.9	mile 1.9 above mouth	tailout	4/17		
90	2.1	mile 2.1 above mouth	riffle	415		
91	2.1	mile 2.1 above mouth	riffle	3/29		
92	2.5	mile 2.5 above mouth	tailout	3/28		
93	2.7	mile 2.7 above mouth	riffle	4/17		
94	2.7	mile 2.7 above mouth	riffle	4/17		
95	2.8	mile 2.7 above mouth	tailout	4/17		
96	2.8	mile 2.8 above mouth	riffle	3/28		
97	2.8	mile 2.8 above mouth	tailout	3/28		
98	2.9	100 yards below Bachlor Canyon	riffle	4/5		

Table G- 1. Continued

Redd #	River Mile	Description of Area	Habitat Type	Date Observed	Total Steelhead on Redds that Date	Total steelhead Holding that Date
99	3 . 0	50 yards below Bachlor Canyon	tailout	4/17		
100	- 3 . 1	cattle chute	tailout	3/28		
101	3.9	145 yards below first crossing	riffle	4/17		
102	3.9	150 yards below first crossing	tailout	4/5		
103	3.9	100 yards below first crossing	riffle	4/5		
104	4 . 0	first crossing	riffle	4/17	[redacted]	
105	4.3	.25 miles below red cabin	riffle	3/19		
106	4.6	red cabin	tailout	3/28		
107	5.0	second crossing	riffle	3/28		
108	5.2	75 yards below third crossing	riffle	4/5		
109	5.3	150 yards above third crossing	tailout	3/28		
110	5.7	50 yards below big rock	riffle	3/28		
111	5.8	150 yards above big rock and 125 yards below good old spot	riffle	4/5		
112	5.8	good old spot	riffle	3/28		
113	5.9	150 yards above good old spot	riffle	4/17		
114	6.5	300 yards below Little Squaw Creek	riffle	3/19		
115	6.7	40 yards below Little Squaw Creek	riffle	3/18		
116	6.8	100 yards above Little Squaw Creek- above indexarea	riffle	3/28		
117	6.8	150 yards above Little Squaw Creek- above indexarea	tailout	3/28		
BUCKAROO CREEK-MOUTH TO 3.0 MILES UPSTREAM						
Dates Surveyed: March 20. April 1, April 30						
118	.3	Yellow house	riffle	4/1		
119	.3	35 yards above yellow house	riffle	[illegible]		
120	.4	Cow pasture house	riffle	3/20		
121	.4	Cow pasture house	riffle	3/20		
122	.6	300 yards above cow pasture house	riffle	3/20		
123	.7	Clif's house	tailout	3/20		[redacted]
			riffle	3/20		
125	.8	200 yards above Clif's	riffle	4/1		
124	.7	Clif's house				
126	.9	400 yards above Clif's house	riffle	3/20		
127	1.0	550 yards above Clif's house	riffle	3/20		
128	1.2	50 yards below basalt falls	tailout	3/20		
129	1.2	Basalt falls tail	tailout	4/1		
MISSION CREEK- MOUTH TO ONE MILE ABOVE SAINT ANDREWS MISSION						
Date Surveyed: April 11						
130	.5	Bronson's-just below Cayuse Highway	tailout	4/11		
131	.5	Bronson's-just below Cayuse Highway	tailout	4/11		
132	.4	new blue house below Bronson's	tailout	4/11		
133	.4	new blue house below Bronson's	tailout	4/11		
MOONSHINE CREEK- HIGHWAY BRIDGE TO MOUM						
Date Surveyed: April 12						
134	.1	/lower road crossing-below colvert	tailout	4/12	1	
135	.1	15 yards downstream	riffle	4/12		
COONSKIN CREEK- MOUTH TO ONE MILE UPSTREAM						
Date Surveyed: April 16						
136	.1	/just above mouth	riffle	4/16		
137	.1	/just above mouth	riffle	4/16		1
EAST FORK MEACHAM CREEK- MOUTH TO FORKS						
Date Surveyed: April 15						
138	.6		riffle	4/15		
MCKAY CREEK						
Date Surveyed: Report by Carl Scheeler						
139	4.0	Carl Scheeler's House	tailout	4/23	1	

Table G-2. Summary of Summer Steelhead Escapement Survey Data in The Umatilla River Basin 1985–1996.

Year	Squaw Creek			Buckaroo Creek			Meacham Creek			NF Meacham Creek			Camp Creek			Boston Canyon Creek			North Fork Umatilla		
i985	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Mites	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Miles
								0	1.5	1	8	3.0	4	2	2.5	10	9	1.0			
1986	25	0	3.5	3	0	2.0	49	2	6.4	27	0	3.0	8	7	2.5	8	0	1.0			
1987	25	13	6.6	0	0	2.0	49	0	9.0	7	2	3.0	12	3	2.5	0	0	1.0	6	2	2.5
1988	95	0	6.6	20	3	3.5	51	1	9.0	10	0	3.0	6	0	2.5	2	0	1.0	1	0	2.5
1989*	46	0	6.6	10	2	3.5	24	0	9.0	4	2	3.0	1	0	4.0	9	0	1.0	3	0	1.5
1990	High Water and Poor Survey Conditions																				
1991	48	–	6.6	21	–	3.0	High Water and Poor Survey Conditions														
1992	77	10	6.7	5	0	3.0	120	39	18.0	30	18	5.0	8	9	2.5	0	0	1.0	17	3	2.5
1993*	10	12	6.7	6	4	3.0	6	5	15.8	3	1	3.3	7	4	2.5	6	3	1.0			
1994	36	4	6.7	0	0	3.0	40	5	18.2	11	6	5.0	6	2	2.5	3	4	1.0	4	0	4.0
1995**	45	21	6.7	6	1	3.0	12	5	3.1	14	3	5.0	5	1	2.5	0	0	1.0	1	1	2.0
1996	58	10	6.7	12	5	3.0	6	4	note8	30	6	5.0	7	5	2.5	9	3	1.0			

NOTES:

1) Variability in areas surveyed, surveyors and survey conditions make direct comparisons of redd data difficult, Compariable from 1992-1996.
2) Steelhead listed were the number observed during the peak survey.
3) 1992– fifteen redds observed in mainstem not listed.
4) 1994– five redds observed in mainstem not listed.
5) *High water was believed to wash out the surface of some redds.
6) ** High water after April 18 washed out the surface of redds previously marked-good survey conditions before the washout
7) Steelhead redds have also been observed in the following tributaries that are not annually surveyed: Duncan Canyon Creek, East Fork Meacham Creek Thomas Creek, Moonshine Creek, Westgate Canyon Creek, Mission Creek, Coonskin Creek, McKay Creek, Buck Creek, Owsley Creek,
8) High spring runoff made accurate enumeration impossible.

AREAS PRESENTLY SURVEYED (1992-1996):

Squaw Creek- Mouth to Little Squaw Creek Confluence- 6.7 miles
Buckaroo Creek- Mouth to top of timber breakout meadow- 3.0 miles
Meacham Creek- Mouth to 18.2 miles upstream- top of the US Forest Service habitat improvement area- 18.2 miles
North Fork Meacham Creek- Mouth to Pot Creek Confluence-5.0 miles
Camp Creek- Mouth to large fork- 2.5 miles
Boston Canyon- Mouth to forks- 1 .0 mile
North Fork Umatilla- Mouth to 1.5 miles above Coyote Creek- 4.5 miles
South Fork Umatiila- Mouth to forks- 3.2 miles
Ryan Creek- Mouth to 3.0 miles upstream- 3.0 miles (lower .3 miles not currently surveyed- private land)- 2.7 miles
Minthorn Springs- Mouth to Confluence of Umatilla- .3 miles
Pearson Creek- Mouth to 6.0 miles upstream- colvert crossing-6.0 miles
West Birch Creek- Bridge Creek to RM 16.0
East Birch Creek- RM 8.5– RM15.0

Table G-2. Continued

Year	South Fork Umatilla			Ryan Creek			Minthorn Springs			Pearson Creek			West Birch			East Birch		
	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Miles	Redds	STS	Miles
1985				2	0	2.0				1								
1986				13	0	2.0												
1987	3	0	3.0	10	0	2.0				22	0	6.0				11	0	5.5
1988	5	1	2.0	9	0	2.0				15	13	6.0	2	0	2.0	39	10	11.0
1989*	7	0	2.0	16	0	3.0												
1990	High Water and Poor Survey Conditions																	
1991	High Water and Poor Survey Conditions																	
1992	15	9	4.2	3	0	3.0	5	0	.2	1	1	6.0	0	0	3.3	4	0	1.0
1993*	8	4	4.2							3	5	8.0	3	0	4.5	11	2	4.5
1994	8	0	4.2	3	0	3.0	1	2	.2	31	9	5.0	20	5	6.0	61	9	7.0
1995**	4	2	3.2							8	1	2.0				31	5	6.5
1996	3	3	note8				2	5	.2	11	1	4.0						

Table G-3. Comparison of Umatilla River Adult Summer Steelhead Released above Three Mile Falls Dam, Redds **and Redds per Mile Surveyed,** 1985 – **1996. (* Estimated)**

Year	Steeihead Escapement		Redds Observed	Miles Surveyed	Redds Per Mile Surveyed
	Natural	Hatchery			
1984–1985	**3197"**	**0**	**33**	23.5	1.4
1985–1986	2885*	**0**	134	20.9	6.4
1986–1987	3444*	**0**	156	52.5	3.0
1987–1988	**2144**	**160**	275	61.0	4.5
1988–1989	1934	353	128	50.2	2.5
1989–1990	1290	102	high water	high water	high water
1990–1991	623	234	high water	high water	high water
1991–1992	2007	315	300	67.2	4.4
1992–1993	1166	455	51–high water	46.6	high water
1993–1994	852	252	235	75.6	3.1
1994–1995	784	530	126	35.3	3.6
1995–1996	1186	617	121	21.7	5.6

Table G-4. Summary of Spring Chinook Salmon Escapement Survey Data, Umatilla River Basin , 1996.

Redd#	R M	Description of Area	Habitat Type	Date Observed	Prespawning Mortalities Sampled! F	Prespawning Mortalities Sampled! M	Spawned Outs Sampled F	Spawned Outs Sampled M
NORTH FORK- MOUTH TO COYOTE CREEK								
Dates Surveyed: August 5, 12, 19, 26 September 3, 9, 17								
1	.1	Lower index area	Tailout	08/05	1	1	38	A
2	.1		Riffle	08/12				
3	.1		Tailout	08/12				
4	.1	100 yards below lower index area	Riffle	08/26				
5	.1		Riffle	08/26				
6	.1	Above Forest Service gabion	Riffle	09/03				
7	.2	Above Forest Service gabion	Riffle	09/03				
.8	Above	Forest Service gabion	Riffle	09/03				
9	A.3ove	Above Forest Service gabion	Riffle	09/03				
10	[A8	b o v e F o r e s t S e r v i c e gabion	Riffle	09/03				
11	.4	30 feet below Forest Service aabion	Tailout	09/03				
12	.5		Tailout	09/09				
13	.5	Lower index area	Tailout	08/19				
14	.5	Top of lower index area	Riffle	08/26				
15	.6		Tailout	09/03				
16	.8		Tailout	08/12				
17	1.0		Riffle	09/03				
18	1.4		Riffle	08/05				
19	1.4		Riffle	08/19				
20	1.5		Tailout	08/12				
21	1.5		Tailout	09/03				
22	1.5		Riffle	09/03				
23	1.6		Tailout	08/26				
24	1.6		Tailout	09/03				
25	1.8		Riffle	08/19				
26	1.8		Tailout	08/19				
27	1.9		Tailout	08/12				
28	1.9		Riffle	08/26				
29	1.9		Riffle	09/03				
30	2.3		Riffle	09/03				
31	2.3		Riffle	08/26				
32	2.3		Riffle	08/12				
33	2.3		Riffle	08/19				
34	2.4		Riffle	08/12				
35	2	2525 yards below Coyote Creek confluence	Tailout	09/03				
3 6		450 yards below Coyote Creek confluence	Riffle	08/12				
37	2.8	225 yards below Coyote Creek confluence	Riffle	08/05				
38	2.9	200 yards below Coyote Creek confluence	Riffle	08/12				
39	2.9	190 yards below Coyote Creek confluence	Riffle	08/12				
40	2.9	190 yards below Coyote Creek confluence	Riffle	08/26				
41	2.9	190 vards below Coyote Creek confluence	Riffle	09/09				
42	2.9	175 yards below Coyote Creek confluence	Tailout	08/12				
43	2.9	175 yards below Coyote Creek confluence	Tailout	08/26				
44	2.9	160 yards below Coyote Creek confluence	Riffle	08/19				
45	2.9	160 yards below Coyote Creek confluence	Riffle	09/17				
LAG -	2.9	145 yards below Coyote Creek confluence	Tailout	09/03				
47	2.9	140 yards below Coyote Creek confluence	Riffle	08/19				
48	3.0	80 yards below Coyote Creek confluence	Tailout	08/12				
49	3.0	80 yards below Coyote Creek confluence	Tailout	09/09				
50	3.0	75 yards below Coyote Creek confluence	Riffle	08/05				
51	3.0	40 yards below Coyote Creek confluence	Riffle	08/19				
FORKS TO THREE MILES DOWNRIVER (FORKS TO BAR M ENTRANCE)								
Dates Surveyed: August 8, 19, 22, 29 September 4, 9, 16								
52	89.5	17 yards below Forks	Riffle	08/08	1	3	46	32
53	89.5	17 yards below Forks	Riffle	09/04				
54	89.5	25 yards below first habitat structure	Riffle	09/04				
55	89.5	33 yards below first habitat structure	Riffle	08/29				

Table G-4. Continued

Redd#	R M	Description of Area	Habitat Type	Date Observed	Preseawninn Mortalities F	Preseawninn Mortalities M	Spawned Outs Sampled F	Spawned Outs Sampled M
56	89.3	30 yards above second habitat structure	Tailout	08/19				
57	89.3	Second habitat structure	Tailout	08/19				
58	89.3	Second habitat structure	Tailout	08/29				
59	89.3	Second habitat structure	Riffle	08/29				
60	89.3	80 yards below second habitat structure	Riffle	08/29				
61	89.3	SO yards below second habitat structure	Riffle	08/29				
62	89.1	60 yards below third habitat structure	08/29ilout					
63	89.1	Upper Corporation Corner	Riffle	08/19				
64	89.1	Upper Corooration Corner	Tailout	08/19				
65	89.1	Upper Corporation Corner	Tailout	09/04				
66	89.1	Upper Corporation	Tailout	08/29				
67	89.1	Upper Corporation	Riffle	09/04				
68	88.5	42 yards below Corporation	Riffle	08/29				
69	88.4	100 yards below Corporation	Riffle	08/22				
70	88.4	125 yards below Corporation	Riffle	09/04				
71	88.4	130 yards below Corporation	Riffle	08/29				
72	88.4	200 yards below Corporation	Riffle	08/19				
73	88.0	Back beaver slough	Tailout	08/29				
74	88.0	Back beaver slough	Riffle	08/19				
75	88.0	Back beaver slough	Riffle	08/19				
76	88.0	75 yards down back beaver slough	Riffle	08/29				
77	87.9	133 yards down back beaver slough	Riffle	08/29				
78	87.9	33 yards below back beaver slough	Tailout	08/29				
79	87.8	100 yards below back beaver slough	Riffle	09/09				
80	87.8	120 yards below back beaver slough	Tailout	08/29				
81	87.8	220 yards below back beaver slough	Riffle	09/16				
82	87.8	275 yards below back beaver slough	Riffle	08/22				
83	87.7	200 yards above bedrock corner	Riffle	08/29				
84	87.7	200 yards above bedrock corner	Riffle	08/29				
85	87.7	Mile 1.8 below forks	Riffle	08/22				
86	87.7	Mile 1.8 below forks	Riffle	09/04				
87	87.2	200 yards above silver building	Riffle	08/29				
88	87.2	150 yards above silver building	Tailout	08/29				
89	87.2	100 yards above silver building	Riffle	08/29				
90	87.1	75 yards above silver building	Riffle	09/04				
91	87.1	75 yards above silver building	Riffle	09/09				
92	87.1	75 yards above silver building	Riffle	09/09				
93	86.8	50 yards above Bear Creek confluence	Riffle	08/29				
94	86.5	Bar M Dam	Riffle	08/29				
95	86.4	100 yards below Bar M Dam	Riffle	08/19				
96	86.2	100 yards below Bar M Footbridge	Tailout	09/04				
97	86.2	100 yards below Bar M Footbridge	Tailout	08/29				
98	86.1	100 yards above pond exit	Riffle	08/29				
99	86.0	Bar M Pond outlet	Riffle	09/04				
100	86.0	Bar M Driveway	Riffle	08/22				
101	86.0	Bar M Driveway	Riffle	08/29				
102	86.0	Bar M Driveway	Riffle	09/04				
103	86.0	Bar M Driveway	Riffle	08/29				
104	86.0	Bar M Driveway	Riffle	08/19				
105	86.0	Bar M Driveway	Riffle	08/29				
106	86.0	Bar M Driveway	HmRiffl	09/16				
107	86.0	Bar M Driveway	Riffle	09/04				
108	85.9	50 yards above my stop	Riffle	08/29				
THREE MILES BELOW FORKS TO SIX MILES BELOW FORKS								
Dates Surveyed: August 22, 29, 30 September 5, 9, 17, 22								
109	858	100 yards below start corner	Tailout	09/05	4	12	46	49
110	858	125 yards below Bar M corner	Tailout	08/22				
111	858	125 yards below Bar M corner	Tailout	08/29				
112	858	125 yards below Bar M corner	Tailout	09/05				
113	858	125 yards below Bar M corner	Tailout	09/17				
114	85.6	300 yards below Bar M corner	Riffle	08/29				
115	85.6	00 yards below Bar M corner	Riffle	09/05				
116	85.6	0 yards below Bar M corner	09/0 Tailout					

Table G-4. Continued

Redd#	R M	Description of Area	Habitat Type	Date Observed	Prespawnina Mortalities F	Prespawnina Mortalities M	Spawned Outs Sampled F	Spawned Outs Sampled M
117	85.6	360 yards below Bar M corner	Tailout	08/22				
118	85.6	360 yards below Bar M corner	Tailout	09/17				
119	85.5	460 yards below Bar M corner	Riffle	08/29				
120	85.5	560 yards below Bar M corner	Riffle	09/09				
121	85.1	Just upstream of new dike work	Riffle	08/29				
122	85.0	New dike work- top end	Tailout	09/05				
123	85.0	New dike work- top end	Tailout	09/05				
124	85.0	New dike work– top end	Tailout	09/05				
125	85.0	New dike work– top end	Tailout	09/17				
126	85.0	60 yards below top of new dike	Tailout	08/2[illegible]				
127	85.0	60 yards below top of new dike	Tailout	08/30				
128	85.0	60 yards below top of new dike	Tailout	08/30				
129	85.0	60 yards below top of new dike	Tailout	08/30				
130	85.0	60 yards below top of new dike	Tailout	09/17				
131	85.0	60 yards below top of new dike	Tailout	09/17				
132	85.0	80 yards below top of dike	Riffle	09/25				
133	84.9	130 yards below top of new dike	Tailout	08/22				
134	84.8	300 yards below new dike	Riffle	08/29				
135	84.8	300 yards below new dike	Riffle	08/29				
136	84.8	300 yards below new dike	Riffle	08/29				
137	84.8	300 yards below new dike	Tailout	09/05				
138	84.8	310 yards below new dike	Tailout	09/17				
139	84.7	Below stage coach corner	Tailout	08/05				
140	84.7	Below stage coach corner	Tailout	09/05				
141	84.7	Below stage coach corner	Tailout	09/05				
142	84.7	Below stage coach corner	Tailout	09/17				
143	84.7	Below stage coach corner	Tailout	09/17				
144	84.7	Below stage coach corner	Tailout	09/17				
145	84.7	Below stage coach corner	Tailout	08/22				
146	84.6	200 yards below stage coach corner	Tailout	09/17				
147	84.1	300 yards above beaver farm	Riffle	08/30				
148	84.1	200 yards above beaver farm	Tailout	08/30				
149	84.1	150 yards above beaver farm	Riffle	09/09				
150	84.1	140 yards above beaver farm	Riffle	08/30				
151	83.7	A–Frame Gulch	Tailout	08/23				
152	83.7	A–Frame Gulch	Tailout	08/30				
153	83.7	A–Frame Gulch	Tailout	08/30				
154	83.7	A–Frame Gulch	Tailout	09/17				
155	83.3	300 yards above Larson's	Tailout	08/30				
156	83.3	300 yards above Larson's	Tailout	08/30				
157	83.3	290 yards above Larson's	Riffle	09/05				
158	83.1	20 yards above Larson's	Riffle	08/30				
SIX MILES BELOW FORKS TO NINE MILES BELOW FORKS (FRED GRAY'S BRIDGE)								
Dates Surveyed: August 23 September 6, 12 ,20, 25								
159	83.0	100 yards below Larson's Mail Box	Riffle	09/06	6	10	42	24
160	82.7	Pig Head Bridge	Tailout	09/06				
161	82.7	60 yards below Pig Head Bridge	Riffle	09/06				
162	82.6	100 yards below Pig Head Bridge	Riffle	09/06				
163	82.5	He She	Riffle	09/06				
164	82.5	Lower He She	Tailout	09/06				
165	82.4	8 yards below lower He She	Riffle	09/06				
166	82.4	8 yards below lower He She	Riffle	09/12				
167	82.3	90 yards above Tuna Corner	Tailout	09/12				
168	82.3	30 yards below Tuna Corner	Riffle	09/06				
169	82.3	Corner	Riffle	08/23				
170	82.3	Corner	Riffle	09/12				
171	81.4	London Bridge	Riffle	09/06				
172	81.4	London Bridge	Tailout	09/06				
173	81.3	Clark White Bridge	Riffle	09/06				
174	81.3	Clark White Bridge	Riffle	09/06				
175	81.2	110 yards below Clark White's Bridge	Riffle	09/06				
176	81.2	100 yards above stream gage near Emmit William's House	Tailout	09/12				
177	81.1	5 yards above gage at Emmit William's	Tailout	09/06				

Table G-4. Continued

Redd#	RM	Description of Area	Habitat Type	Date Observed	Prespawning Mortalities Sampled F	Prespawning Mortalities Sampled M	Spawned Outs Sampled F	Spawned Outs Sampled M
178	81.1	7 yards below aaae at Emmit William's	Riffle	08/23				
179	81.1	7 yards below gage at Emmit William's	Riffle	09/06				
180	81.1	7 yards below gage at Emmit William's	Riffle	09/06				
181	81.1	17 yards below gage at Emmit William's	Riffle	09/12				
182	81.0	120 yards below rock dam below Emmit William's	Riffle	09/12				
183	81.0	125 yards below rock dam below Emmit William's	Riffle	09/12				
184	80.9	Lower habitat structure below Emmit William's	Riffle	09/06				
185	80.9	Lower habitat structure below Emmit William's	Riffle	09/12				
186	80.9	Lower habitat structure below Emmit William's	Tailout	09/12				
187	80.9	12 yards below lower habitat structure below Emitt William's	Riffle	09/12				
188	80.5	Gravel pit below Emmit William's	Riffle	09/12				
189	80.5	Gravel pit below Emmit William's	Riffle	09/12				
190	80.5	Gravel pit below Emmit William's	Riffle	09/12				
191	80.5	Gravel pit below Emmit William's	Riffle	09/06				
192	80.5	Gravel pit below Emmit William's	Riffle	09/12				
193	80.5	Gravel pit below Emmit William's	Riffle	09/12				
194	80.5	Gravel pit below Emmit William's	Riffle	09/25				
195	80.3	Upper new house	Riffle	09106				
196	80.3	50 feet below upper new house	Riffle	09/12				
197	80.3	50 feet below upper new house	Riffle	09/06				
198	80.3	New house	Riffle	09/06				
199	80.2	100 yards below new house (Beer's)	Tailout	09/25				
200	80.1	100 yards above Fred Gray's Bridge	Tailout	09/06				
201	80.0	85 yards above Fred Gray's Bridge	Riffle	09/12				
202	80.0	78 yards above Fred Gray's Bridge	Riffle	09/12				
NINE MILES BELOW FORKS TO TEN MILES **BELOW FORKS (FGB TO MEACHAM CONFLUENCE)**								
Dates Surveyed: August 13, 27 September 3, 10,16,20								
203	80.0	40 yards below Fred Gray's Bridge	Riffle	09/10	7	7	32	23
204	80.0	50 yards below Fred Gray's Bridge	Riffle	09/03				
205	79.9	120 yards below Fred Gray's Bridge	Riffle	09/10				
206	79.9	120 yards below Fred Gray's Bridge	Riffle	09/10				
207	79.8	40 yards above intake to Imeques	Riffle	09/03				
208	79.8	30 yards above intake to Imeques	Riffle	09/10				
209	79.8	20 yards above intake to Imeques	Riffle	09/10				
210	79.8	Imeques intake	Riffle	09/10				
211	79.8	60 yards below intake to Imeques	Riffle	09/03				
212	79.8	75 yards below intake to Imeques	Riffle	09/03				
213	79.7	200 yards below intake to Imeques	Riffle	09/10				
214	79.7	205 yards below intake to Imeques	Riffle	09/03				
215	79.7	207 yards below intake to Imeques	Riffle	09/03				
216	79.7	210 yards below intake to Imeques	Riffle	09/03				
217	79.6	100 yards above old rotary trap site at Fred Gray's	Riffle	09/03				
218	79.6	108 yards above old rotary trap site at Fred Gray's	Riffle	09/16				
219	79.5	45 vards above old rotarv traw site at Fred Gray's	Riffle	09/16				
220	79.5	40 yards above old rotarv traw site at Fred Gray's	Riffle	09/10				
221	79.5	30 yards above old rotary trap site at Fred Gray's	Riffle	08/27				
222	79.5	25 yards above old rotary trap site at Fred Gray's	Riffle	09/03				
223	79.5	Old rotary trap site at Fred Gray's	Riffle	09/03				
224	79.5	8 yards below old rotary trap site at Fred Gray's	Riffle	09/03				
225	79.4	100 yards below old rotary trap site at Fred Gray's	Riffle	09/03				
226	79.4	150 yards below old rotary trap site at Fred Gray's	Riffle	09/10				
227	79.1	250 yards above Meacham confluence	Riffle	09/10				
228	79.1	250 yards above Meacham confluence	Riffle	09/10				
229	79.1	217 yards above Meacham confluence	Riffle	09/10				
230	79.1	140 yards above Meacham confluence	Riffle	09/03				
231	79.1	140 yards above Meacham confluence	Riffle	09/10				
232	79.1	107 yards above Meacham confluence	Riffle	09/10				
233	79.0	82 yards above Meacham confluence	Riffle	09/03				
234	79.0	30 yards above Meacham confluence	Tailout	09/10				
235	79.0	30 yards above Meacham confluence	Tailout	09/16				
236	79.0	Just above Meacham confluence	Riffle	09/10				
TEN MILES BELOW FORKS TO TWELVE **MILES BELOW FORKS (MEACHAM** TO SQUAW CREEK)								
Dates Surveyed: August 13, 27 September 3, 10 16, 23								

Table G-4. Continued

Redd#	RM	Description of Area	Habitat Type	Date Observed	Prespawning Mortalities F	Prespawning Mortalities M	Spawned Outs Sampled F	Spawned Outs Sampled M
237	79.0	33 yards below Meacham confluence	Tailout	09/10	26	17	21	17
238	79.0	33 yards below Meacham confluence	Tailout	09/16				
239	79.0	50 yards below Meacham confluence	Riffle	09/10				
240	79.0	56 yards below Meacham confluence	Riffle	09/03				
241	79.0	100 yards below Meacham confluence	Tailout	09/20				
242	78.9	175 yards below Meacham confluence	Riffle	09/03				
243	78.9	205 yards below Meacham confluence	Riffle	09/10				
244	78.9	355 yards below Meacham confluence	Riffle	09/10				
245	78.8	388 yards below Meacham confluence	Riffle	09/10				
246	77.6	75 yards above Gibbon Railroad Siding	Riffle	09/10				
247	77.6	75 yards above Gibbon Railroad Siding	Tailout	09/16				
248	77.6	76 yards above Gibbon Railroad Siding	Riffle	09/10				
249	77.6	68 yards above Gibbon Railroad Siding	Riffle	09/10				
250	77.5	Gibbon Railroad Siding	Riffle	09/10				
251	77.5	Gibbon Railroad Siding	Riffle	09/10				
252	77.5	Gibbon Railroad Siding	Riffle	09/10				
253	77.5	Gibbon Railroad Siding	Riffle	09/10				
354	77.5	Gibbon Railroad Siding	Riffle	09/10				
755	77.4	200 yards below Gibbon Railroad Sidina	Riffle	09/16				
256	77.2	New house above Squaw Creek	Riffle	09/10				
257	77.2	New house above Squaw Creek	Riffle	09/10				
258	77.2	New house above Squaw Creek	Riffle	09/10				
259	77.2	New house above Squaw Creek	Riffle	09/10				
260	77.1	100 yards below new house above Squaw Creek	Riffle	09/10				
261	76.8	225 yards above Squaw Creek confluence	Riffle	09/10				
262	76.8	205 yards above Squaw Creek confluence	Riffle	09/10				
263	76.8	205 yards above Squaw Creek confluence	Riffle	09/10				
264	76.8	125 yards above Squaw Creek confluence	Riffle	09/10				
265	76.8	100 yards above Squaw Creek confluence	Riffle	09/10				

TWELVE MILES BELOW FORKS TO FIFTEEN MILES BELOW FORKS (SQUAW TO THOR HOLLOW)

Dates Surveyed: August 6, 14, 20, 27 September 4, 10, 17, 23

266	76.6	100 yards below Squaw Creek confluence	Riffle	09/04	51	12	19	17
267	76.6	125 yards below Squaw Creek confluence	Tailout	09/04				
268	76.6	125 yards below Squaw Creek confluence	Tailout	09/10				
269	76.6	135 yards below Squaw Creek confluence	Tailout	09/04				
271	76.6	135 yards below Sauaw Creek confluence		09/17				
	76.6	150 yards below Squaw Creek confluence	Tailout	09/17				
272	76.6	155 yards below Squaw Creek confluence	Riffle	09/10				
273	76.5	275 yards below Squaw Creek confluence	Tailout	09/04				
274	76.5	275 yards below Squaw Creek confluence	Tailout	09/10				
275	76.5	Below tire dump	Tailout	09/04				
276	76.5	Below tire dump	Tailout	09/10				
277	76.5	Below tire dump	Tailout	09/10				
278	76.1	.6 miles below start	Tailout	09/04				
279	76.1	.6 miles below start	Tailout	09/04				
280	76.1	.6 miles below start	Tailout	09/17				
281	76.1	.6 miles below start	Tailout	09/10				
282	76.1	.6 miles below start	Riffle	09/04				
283	75.5	Trailer corner	Tailout	08/27				
284	75.5	Trailer corner	Tailout	09/10				
285	75.5	15 yards downstream	Riffle	09/10				
286	75.3	Below trailer corner	Riffle	09/23				
287	75.2	50 yards below exposed waterline	Tailout	09/10				
288	75.2	50 yards below exposed waterline	Tailout	09/23				
289	75.2	50 yards below exposed waterline	Tailout	09/10				
290	75.1	100 yards below exposed waterline	Riffle	09/10				
291	74.7	Just above Wither's swim hole	Tailout	09/04				
292	74.6	Just above Wither's swim hole	Tailout	09/10				
293	74.5	Wither's	Tailout	09/04				
294	74.5	Wither's	Tailout	09/10				
295	74.5	Wither's	Tailout	09/23				
296	74.5	Wither's	Tailout	09/10				
297	74.5	/Across from Wither's House	Tailout	09/17				

Table G-4. Continued

Redd#	RM	Description of Area	Habitat Type	Date Observed	Prespawning Mortalities F	Prespawning Mortalities M	Spawned Out Sampled F	Spawned Out Sampled M
298	74.0	.5 miles above Thornhollow Bridge	Riffle	09/10				
299	74.0	.5 miles above Thornhollow Bridge	Riffle	09/10				
300	74.0	.5 miles above Thornhollow Bridge	Riffle	09/10				
301	74.0	.5 miles above Thornhollow Bridge	Riffle	09/23				
302	74.0	.5 miles above Thornhollow Bridge	Riffle	09/10				
303	73.8	Below Wither's	Riffle	09/17				
304	73.8	Below Wither's	Tailout	09/23				
305	73.7	300 yards above Thornhollow Bridge	Riffle	09/04				
306	73.7	300 yards above Thornhollow Bridge	Riffle	09/17				
307	73.5	10 yards above Thornhollow Bridge	Riffle	09/17				
THORNHOLLOW BRIDGE TO LOUIE DICK'S FENCE								
Dates Surveyed: August 20, 28 September 4, 10, 18								
308	73.5	Lower side of Thornhollow Bridge	Tailout	09/04	34	7	15	17
309	73.5	Outlet of Thornhollow acc. ponds	Tailout	09/04				
310	73.4	150 yards below Thornhollow Bridge	Tailout	09/10				
311	73.4	183, yards below Thornhollow Bridae	Riffle	09/04				
312	73.2	Upper Dike	Tailout	08/28				
313	73.2	Upper Dike	Riffle	09/10				
314	73.2	Upper Dike	Tailout	09/04				
315	73.1	Lower upper dike	Riffle	09/10				
316	72.9	Caldwell's	Tailout	09/10				
317	72.6	Lower Caldwell's	Tailout	09/10				
318	72.6	Lower Caldwell's	Tailout	09/10				
319	72.6	Lower Caldwell's	Riffle	09/10				
320	72.6	Lower Caldwell's	Tailout	09/18				
321	71.9	Upper Antone Minthorn's	Tailout	09/10				
322	71.8	Antone Minthorn's	Tailout	09/10				
323	71.5	60 yards below Thornhollow RR Bridge	Riffle	09/10				
324	71.2	Darryl Thomson's House	Tailout	09/18				
325	70.4	Thames	Tailout	09/04				
326	70.4	Thames	Riffle	09/10				
327	70.0	130 yards above stop corner	Tailout	09/04				
328	70.0	130 yards above stop corner	Tailout	09/10				
LOUIE DICK'S FENCE TO CAYUSE RAILROAD BRIDGE								
Dates Surveyed: August 28 September 5, 11, 18								
329	70.0	Near start	Tailout	09/11	12	5	3	3
330	69.8	275 below start	Tailout	09/05				
331	69.8	275 yards below start	Tailout	09/18				
332	69.7	325 yards below start	Tailout	09/11				
333	69.6	Across from Louie Dick's House	Tailout	09/11				
334	69.6	.4 miles below start	Tailout	09/18				
335	67.7	Cayuse dike	Riffle	09/11				
336	67.7	Cayuse dike	Riffle	09/18				
CAYUSE RAILROAD BRIDGE TO MINTHORN SPRINGS								
Dates Surveyed: August 7, 15, 28 September 5, 11					23	10	1	2
MEACHAM CREEK-MILES THREE THROUGH SIX ABOVE MOUTH								
Dates Surveyed: September 12, 19								
337	6.4	1.1 miles below Cougar Canyon	Tailout	09/12	0	0	0	2
338	6.7	.8 miles below Cougar Canyon	Tailout	09/19				
339	6.7	.8 miles below Cougar Canyon	Tailout	09/12				
340	7.3	.2 miles below Cougar Canyon	Tailout	09/12				
341	7.5	Just below Cougar Canyon	Tailout	09/12				
MEACHAM CREEK-MILES SIX THROUGH 9.8 ABOVE MOUTH								
Dates Surveyed: August 9, September 6, 19								
342	9.3	First fence crossing below Duncan RR Bridge	Tailout	09/12	0	1	1	0
343	9.3	First fence crossing below Duncan RR Bridge	Tailout	09/06				
344	9.7	450 yards below Duncan RR Bridge	Riffle	09/06				
NORTH FORK MEACHAM CREEK- MOUTH TO BEAR CREEK								
Dates Surveyed: September 19, 30								
345	.1	100 yards above trailer 300 yards above mouth	Tailout	09/30	0	0	1	0
346	.1	150 yards above trailer 300 yards above mouth	Tailout	09/30				
347	1.5	1.5 miles above mouth	Tailout	09/19				
		TOTAL			165	85	265	

Table G-5 Spring Chinook Salmon Escapement Data in the Umatilla River, 1996.

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	spawning Status	Date	Remarks
670	630	no	F	03	NF- 200 yards above mouth		LV	PM	08/05/96	gills good- both eyes buldging out, tissue around orbit dark purple, paired fins good, deed 2 days
[illegible]		yes	M	03	mile 2.8 below CCC-NF		NM	PM	09/03/96	CTC-gills OK
610	740	no	F	02	1 .O miles below CCC-NF		NM+UC	R50	09/09/96	
635	[illegible]	no	F	03	mile 2 6 below CCC-NF		LV	s o	09/03/96	CTC-dead 6 days
640	760	no	F	01	Mile l.OBCCC -NF	96G0282	Ad	s o	09/17/96	Dead 6 days-CTC
645		yes	F	01	NF-225 yards below CCC		no	S0	08/19/96	CTC
635	795	no	F	01	175 yards below CCC-NF		LV+UC	S0	09/09/96	- -
630	750	"Cl	F	02	Mile 1.4 below CCC-NF	96G0247	Ad	S0	09/09/96	CTC
630		no	F	01	NF- 110 yards below CCC		LV+UC	S0	08/26/96	Gills fair
630		yes	F	02	mile 1 8 below CCC-NF		NM	S0	09/03/96	CTC
645		no	F	01	NF- 160 yards below CCC		LV	S0	08/19/96	Dead 4 days-CTC
645	790	no	F	02	Mile 1 5 below CCC-NF		NM	s o	09/09/96	Died today
645		no	F	03	mile 2.4 below CCC-NF		LV	s o	09/03/96	CTC-dead 1 week
650		no	F	02	Good old spot-NF		LV	s o	09/17/96	Dead 5 days-CTC
660		no	F	03	NF- mile 2.6 below CCC		LV	s o	08/26/96	dead 2 days- good gills- CTC
675	790	no	F	02	Mile 1 .0 below CCC-NF		LV	s o	09/09/96	
685		yes	F	01	190 yards below CCC-NF		NM	s o	09/03/96	Dead 2 days
730	880	yes	F	01	NF-200 feet below CCC		NM+UC	SO	08/26/96	good gills
730		no	F	02	NF- mile1.0 below CCC		RV	SO	08/26/96	good gills- dead 3 days
630	750	no	F	03	mile 2.9 below CCC-NF		LV	s o	09/09/96	CTC
630	760	no	F	01	NF- 175 yards below CCC	96G0201	Ad	s o	08/19/96	Dead 2 days-CTC
630		no	F	01	NF-200 yards below CCC		LV	so --	08/26/96	CTC
625		no	F	01	Mile 1 .0 below CCC-NF		LV	s o	09/03/96	CTC-dead 2 days
615		no	F	03	mile 2.6 below CCC-NF		LV	s o	09/03/96	CTC-died today
455	580	no	F	03	mile 2.2 below CCC-NF		?	s o	09/09/96	CTC-can't tell ventrals
575		no	F	02	NF-mile 1.8 below CCC		LV	s o	08/26/96	CTC- died today
590		no	F	03	Gabion-NF		LV	SO	09/17/96	Dead 4 days-CTC
595		no	F	03	mile 2 6 below CCC-NF		LV	SO	09/03/96	CTC-dead 3 days
595		no	F	01	100 yards below CCC-NF	96G0281	Ad	SO	09/17/96	Dead 4 days-CTC
610		no	F	01	175 yards below CCC-NF		LV	SO	09/03/96	Dead 5 days-CTC
610		yes	F	02	NF- 1 8 miles below Coyote Creek			SO	08/12/96	Caudal- couldn't tell- WILD FISH
630		no	F	01	NF-205 yards below CCC		LV	SO	08/26/96	CTC
615		no	F	02	NF- Top of good old spot	96G0214	Ad	SO	08/26/96	Small ad-dead 3 days-CTC
625	755	no	F	03	mile 2.0 below CCC-NF	9600246	Ad	SO	09/09/96	CTC
615		no	F	02	NF-mile 1.4 below CCC		LV	SO	08/26/96	sacrificed- good gilk-CTC
620		na	F	02	NF-mile 1 2 below CCC	96G0215	Ad	s o	08/26/96	died today-good gills-CTC
620		yes	F	01	165 yards below Coyote C - NF		NM	s o	09/17/96	Sacrificed-CTC
620		no	F	01	NF-450 yards below CCC		LV	s o	08/26/96	CTC- dead 2 days
625		no	F	02	NF- milel.0 below CCC			s o	08/26/96	CTC
625		no	F	02	NF- mile1 .0 below CCC	9660211	no	s o	08/26/96	CTC
680	665	no	M	02	Mile 1 .2 below CCC-NF		LV	s o	09/03/96	NCP-good gills
700	915	no	M	03	mile 2.6 below CCC-NF		LV	SO	09/09/96	CTC
680	860	no	M	03	75 yards below Bridge-NF		LV	s o	09/04/96	NCP-NCP
640		no	M	02	NF-1.4 miles below CCC	96G0202	Ad+UC	s o	08/19/96	small ad
Adult		no	?	02	Mile 1.2 below CCC-NF		?	?	09/03/96	Bear observed with unsampled CHS in mouth
665	820	no	M	06	Bar M Drive		LV+UC	partial	09/04/96	Dead 2 days
670		no	M	05	250 yards below Back Beaver slough	96G0221	Ad	partial	08/29/96	Dead 5 days-CTC
625		no	M	06	200 yards below Bar M Footbridge		LV	partial	08/29/96	Bad gills-CTC
640	840	no	M	06	Barr- - - - - -	96GOIII	Ad	partial	09/09/96	KD sample
415		no	M	05	100 yards below Back Beaver Slough		RV	partial	08/28/96	Died today-NCP
630	800	no	M	05	200 yards below Back Beaver slough		LV+UC	partial	08/29/96	Sacrificed
700	870	no	M	05	1.9 miles below Forks		LV	partial	09/09/96	
655	820	no	M	04	Corp		LV+UC	Partial	09/04/96	Dead 2 days
635	795	no	M	06	100 yards below Bar M Dam		LV	Partial	09/04/96	dead 2 days-NCP
645	825	no	M	05	450 yards below Back Beaver Slough		LV	Partial	09/04/96	CTC-dead 2 days
635	800	yes	M	06	MJust above Beer Creek		NM	Partial	09/04/96	dead 1 week
620	765	no	F	05	100 yards above Beaver Slough		LV+UC	PM	08/22/96	Dead 1 day-Bad Gills-had started to dig

Table G-5 Continued

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remarks
635	810	yes	M	06	100 yards below Bar M Bridge		LV?	PM	09/04/96	Dead 1 day – ??on lv clip
665	850	no	M	05	bedrock corner		LV	PM	09/04/96	CTC – died today
675	860	no	M	05	200 yards below Back Beaver slough		LV	PM	08/29/96	D ead 2 days – CTC
630		no	F	05	Back Beaver Slough	96G0225	Ad+UC	R100	09/04/96	Bad gills – dead 3 days
650	795	no	F	05	Mile 1.8 below Forks		LV+UC	R200	08/29/96	Bad gills
635	765	no	F	04	above Corp corner		LV+UC	R250	09/04/96	Bad gills
585	690	no	F	04	Below Forks-2nd habitat structure		RV	R30	09/16/96	CTC
605		yes	F	04	above Corp corner		NM	R300	09/04/96	
645		no	F	05	bedrock corner		LV	R500	09/04/96	CTC – dead 1 week – small ad???
685	840	no	F	04	Corp		LV+UC	R500	09/04/96	
630	750	no	F	06	Bar M		LV+UC	R7	09/09/96	
640		no	F	05	Back Beaver Slou gh	96G0224	Ad	SO	09/04/96	CTC – dead 5 days
640		no	F	05	150 yards above silver bldg.		LV	s o	09/04/96	CTC – dead 2 days
570	690	yes	F	04	Corp		NM	s o	09/09/96	
610	760	no	F	06	Bar M		LV	s o	09/16/96	CT
640		no	F	05	350 yards below Back Beaver Slough		LV	SO	09/04/96	CTC – dead 3 days
655		no	F	05	Back Beaver Slou gh		LV	SO	08/29/96	Dead 3 days – CTC
620	725	no	F	06	Bar M Drive		LV	SO	09/04/96	Dead 5 days – CTC
		yes		06	Bar M		NM	SO	09/09/96	
665		yes	F	05	3 miles below Corp		NM	SO	09/09/96	
600	720	yes	F	06	Bar M Dam		NM+UC	SO	09/04/96	
595	720	no	F	06	1.6 miles below Corp		LV	SO	09/09/96	
565		no	F	06	Bar M		LV	SO	09/16/96	CTC
630		no	F	05	100 yards below Back Beaver Slough		LV	s o	09/04/96	CTC- dead 3 days
615	725	no	F	06	Bar M		LV	s o	09/16/96	CTC
620	790	"Cl	F	04	Corp --	96G0153	Ad	SO	09/09/96	
675	800	no	F	06	Bar M		LV	s o	09/16/96	CTC
650	765	no	F	04	Upper Corp Corner		LV	s o	09/16/96	CTC
640		no	F	04	second habitat structure below Forks	9660219	Ad	SO	08/29/96	Dead 4 days
640	760	no	F	04	Corp		LV	s o	09109196	
620	750	no	F	05	Back Beaver Slough		LV	s o	09/04/96	CTC – dead 5 days
620		no	F	04	second habitat structure below Forks		LV+UC	s o	08/29/96	Dead 4 days
615	735	no	F	06	Bar M		LV	s o	09116196	CTC
610		no	F	04	3rd structure below Forks		LV	s o	09/04/96	CTC-dead 1 day
610	725	no	F	04	Below Forks		LV	s o	09/04/96	CTC-dead 2 days
590		no	F	04	3rd structure below Forks		LV	s o	09/04/96	CTC-dead 5 days
*	830	yes	F	04	150 yards below Forks	96G0203	Ad	SO	08/19/96	
625	755	no	F	05	Forks to Bar M		LV	SO	09/09/96	
645			F	06	100 yards below Ear M Bridge		LV	s o	09/04/96	Bad gills – dead 2 days
620		no	F	05	Back Beaver Slough		LV	s o	08/29/96	Died today – NCP
640		no	F	06	Bar M Drive		LV	S O	09/04/96	Dead 6 days-CTC
620		no	F	05	below Corp		LV	SO	09/04/96	CTC
620	745	yes	F	05	4 miles below Corp		NM	s o	09/09/96	
685	800	no	F	04	.2 miles below Forks		LV	s o	09/09/96	
610		no	F	05	100 yards below Back Beaver Slough	96G0223	Ad	s o	09/04/96	CTC-dead 1 day – KD sample
520	600	no	F	05	Below Back Beaver Slou gh		LV	s o	09/16/96	CTC
730	890	yes	F	04	Below Forks		NM	s o	09/04/96	CTC-sacrificed
635		no	F	06	Bar M Driveway		LV	s o	08/29/96	CTC
660		no	F	06	Bar M Driveway		LV	s o	08/29/96	CTC
635	810	no	MI	05	250 yards below Back Beaver Slough		LV	SO	09/04/96	CTC – dead 2 days
640	830	no	M	06	Bar M Drive		LV	SO	09/04/96	Dead 5 days – CTC
690	880	no	M	06	Bar M		LV	SO	09/09/96	
720	915	no	M	06	Bar M Drive		LV+UC	SO	09/04/96	Dead 5 days
645	815	no	M	06	Bar M Drive		LV	SO	09/04/96	Died today – NCP
445	545	no	M	04	Corp		RV	s o	09/09/96	
700	850	no	M	04	3 miles below Forks		RV	s o	09/09/96	
785	995	no	M	04	250 yards below Forks		RV	s o	08/19/96	
580	730	no	M	Upper Corporation Corner			LV+UC	so --	08/29/96	Dead 1 day
610	780	no	M	04	Upper Corporation Corner		LV+UC	s o	08/29/96	Dead 3 days
620	770	no	M	04	125 yards below Forks		LV+UC	s o	08/29/96	Dead 3 days

Table G-5 Continued

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remarks
650		no	M	04	second habitat structure below Forks		LV+UC	SO	08/29/96	Dead 4 days
680	860	no	M	04	3rd structure below Forks		LV	SO	09/04/96	CTC
610	790	no	M	06	Bar M		LV	SO	09/09/96	
670	850	no	M	05	.5 miles below Corp		LV	SO	09/09/96	
415	505	no	M	05	.2 miles below Corp		RV	SO	09/09/96	
620	775	no	M	05	150 yards above silver bldg.		LV	SO	09/04/96	CTC-dead 2 days
625		no	M	05	Corp		LV	SO	09/04/96	CTC-dead 5 days
655		no	M	05	110 yards below Corp Hole	96G0220	AD	SO	08/29/96	Dead 4 days-CTC
660		no	M	05	Corporation		LV	S O	08/29/96	Dead 1 day-CTC
665		no	M	05	Corporation		RV+UC	s o	08/29/96	Dead 3 days
660	850	no	M	06	100 yards below Bar M Bridge		LV+UC	?	09/04/96	dead 6 days
730	900	no	M	06	Bar M Dam	96G0222	Ad+UC	?	09/04/96	
595	720	no	M	08	Below Stage Coach Corner		LV	Partial	09/17/96	CTC
655	815	no	M	08	50 yards above Beaver Farm		LV	Partial	09/05/96	NCP + dead 3 days
465	565	no	M	08	New work dike below Bar M		RV	Partial	09/17/96	CTC
660	860	no	M	08	Top of new dike below Bar M		LV	Partial	09/05/96	CTC + dead 2 days
580	730	no	M	07	Stone Trap below Bar M Driveway		LV	Partial	09/17/96	CTC
690	860	no	M	07	Stone Trap below Bar M Driveway		LV	Partial	09/17/96	CTC
665	830	no	M	08	New work dike below Bar M		LV	Partial	09/17/96	CTC
645	830	no	M	08	Lower Stage Coach		LV	Partial	09/05/96	CTC + dead 6 days
600	735	yes	F	07	.3 miles above milepost 26		LV	PM	07/30/96	DW
Adult		no	F	08	2010 yards below Clark's			PM	08/13/96	Dead 1 week+-Couldn't tell other marks
670	810	no	F	08	75 yards below Clark's Bridge				08/23/96	NCP-Bad Gills
645	735	no	F	08	2.0 miles below Bar M		LV	PM	08/16/96	
	775	no	M	07	Below Bar M		LV	PM	06/20/96	From John Germond-- 12/05/96
660	810	no	M	07	Stone Trap below Bar M Driveway		LV	PM	09/05/96	CTC + dead 3 days
630	780	no	M	08	Clarks Bridge		LV	P M	09/05/96	NCP + dead 3 days
640	810	yes	M	07	.4 miles below Bar M		LV	PM	07/31/96	
660	840	no	M	08	200 yards below Log Truck House	96G0251	Ad	PM	08/22/96	KD sample + Dead 2 days
605	740	no	M	07	100 yards below Bar M Driveway	96G0210	Ad	PM	08/22/96	Dead 1 day-CTC
620	740	no	M	07	Stone Trap below Bar M Driveway		LV	PM	09/05/96	CTC + dead 2 days
410		no	M	07	100 yards below Bar M Driveway		RV	PM	08/29/96	CTC
630	760	yes	M	07	Stone Trap below Bar M Driveway		NM	PM	09/05/96	CTC + dead 3 days
600		no	M	07	100 yards below Bar M Driveway		No	PM	08/29/96	CTC
610	780	no	M	08	A-Frame Gulch		LV	PM	09/17/96	CTC
570	730	no	M	08	75 yards below Cedar House-new dike area		LV	PM	08/22/96	Dead 1 day-NCP
655	780	no	F	08	A-Frame Gulch	96G0515	Ad	R10	09/17/96	CTC
635	760	no	F	07	Below Lower Bar M Corner		LV+UC	R10	09/17/96	
630		no	F	08	80 yards below new Dike		LV	R100	08/29196	Dead 4 days-CTC
635	760	no	F	07	Stone Trap below Bar M Driveway		L"	R135	09/05/96	CTC + dead 5 days
635	760	no	F	08	Below Stage Coach Corner	96G0513	Ad+uc	R15	09/17/96	No kid
635	765	no	F	07	Below Bar M Corner	9660526	Ad	R15	09/09/96	KD sample
635	760	no	F	07	Below Bar M Corner		LV	R1600	09/09/96	
635	765	no	F	07	Below Bar M Corner		LV	R20	09/09/96	
700	855	yes	F	08	Lower Stage Coach		NM+UC	R200	09/05/96	Dead 3 days
645	770	no	F	08	50 yards above Beaver Farm		LV	R200	09/05/96	CTC + dead 3 days
615	755	no	F	07	125 yards below Bar M Corner	96G0531	Ad	R25	09/09/96	KD sample
670	810	no	F	07	Stone Trap below Bar M Driveway		LV	R30	09/05/96	c
620	750	no	F	08	200 yards below Log Truck House		LV	R300	09/05/96	CTC + dead 4 days
670	760	no	F	08	50 yards above Beaver Farm		LV	R300	09/05/96	cTC + dead 3 days
670	600	no	F	08	New work dike below Bar M		LV	R5	09/17/96	CTC
610	725	no	F	08	A-Frame Gulch		L"	R5	09/17/96	CTC
680	605	no	F	08	Below Stage Coach Corner		LV	R5	09/17/96	C
615	755	no	F	08	Beaver Farm		LV+UC	nsod	08/30/96	
680	630	no	F	07	500 yards below Bar M	96G0226	Ad	R75	09/05/96	CTC + dead 2 days + KD sample
620	765	no	F	07	Below Lower 07 Bar M Corner		LV+UC	R75	09/17/96	
660		no	F	08	Lower Stagecoach stop		LV+UC	SO	08/29/96	
610	720	no	F	08	Top of new dike below Bar M		LV	SO	09/05/96	CTC + dead 5 days
630		no	F	08	Lower Stage Coach		LV	SO	09/05/96	CTC + dead 3 days

Table G-5. Continued

MEHF	F	L	Scales	sex	Area Code	Area Sampled	Tag Code	Marks	spawning status	Date	Remarks
645	780		no	F	08	Larson's	96G0238	Ad	SO	09/05/96	CTC+dead 4 days
610	730		no	F	08	Stage Coach Stop		LV	SO	08/30/96	
630	760		yes	F	08	Below dike below Bar M		NM	SO	09/05/96	CTC+dead 3 days
620	745		no	F	08	Below dike below Bar M		LV	SO	09/05/96	CTC+dead 1 week+
695	805		no	F	08	Top of new dike below Bar M	96G0227	Ad	SO	09/05/96	CTC+dead 3 days
615	725		no	F	08	Clark's Bridge	96G0237	Ad	SO	09/05/96	CTC+dead 5 days
620	745		no	F	08	Just above Larson's	96G0518	Ad+LV	SO	09/17/96	CTC
615	735		no	F	08	Below dike below Bar M		LV+UC	SO	09/05/96	
620	740		no	F	08	Top of new dike below Bar M	96G0235	Ad	SO	09/05/96	CTC+dead3 days
645	800		no	F	08	Top of new dike below Bar M		LV+UC	SO	09/05/96	
620			yes	F	07	500 yards below Bar M		NM	SO	09/05/96	CTC+dead 2 days
675	795		no	F	08	Lower Stage Coach		LV	SO	09/05/96	CTC+dead 3 days
635	765		no	F	08	Top of new dike below Bar M		LV	SO	09/05/96	CTC+dead 2 days
640	755		no	F	07	Below Bar M Corner		LV	SO	09/09/96	
610	730		no	F	07	Stone Trap below Bar M Driveway		LV	SO	09/17/96	CTC
660	760		no	F	08	New Dike to Stage Coach		LV	SO	09/25/96	CTC Dead 5+ days EH
600	710		yes	F	07	125 yards below Bar M Corner		NM	SO	09/09/96	
665	810		no	F	07	Below Stone Trap below Bar M	96G0228	Ad	SO	09/05/96	CTC+dead 5 days
645	765		no	F	08	Clark's Bridge	96G0236	Ad	SO	09/05/96	CTC+dead 4 days
700	840		no	F	08	Lower Stage Coach	96G0234	Ad	SO	09/05/96	CTC+KD+dead 1 day
655	780		no	F	08	Lower Stage Coach	96G0233	Ad	SO	09/05/96	CTC+dead 5 days
690	825		no	F	07	Below Lower Bar M Corner	96G0512	Ad	SO	09/17/96	CTC+no kid+dead 7 days
690	790		no	F	08	New Dike to Stage Coach		LV	SO	09/25/96	CTC Dead 2+ Days EH
710	850		no	M	08	New Dike to Stage Coach		LV	SO	09/25/96	CTC Dead 5+ days EH
780	960		no	M	08	Top of new dike below Bar M	96G0230	Ad	SO	09/05/96	CTC+dead5 days
650	850		no	M	08	Lower Stage Coach		LV	SO	09/05/96	CTC+dead 3 days
660			no	M	08	Lower Stagecoach stop		NO	SO	08/29/96	NCP
725	910		no	M	08	A-Frame Gulch		LV	SO	09/05/96	CTC+dead 5 days
640	845		no	M	08	Lower Stage Coach		LV	SO	09/05/96	CTC+dead 5 days
360	435		no	M	07	Stone Trap below Bar M Driveway		RV+UC	SO	09/17/96	dead 5 days
635	830		no	M	08	Lower Stage Coach		LV	SO	09/05/96	CTC+dead 5 days
555	680		yes	M	07	Stone Trap below Bar M Driveway		NM	SO	09/05/96	CTC+dead 5 days
490	630		no	M	07	Stone Trap below Bar M Driveway		RV	SO	09/17/96	CTC
635	805		no	M	07	Stone Trap below Bar M Driveway		LV	SO	09/17/96	CTC
600	750		no	M	07	Stone Trap below Bar M Driveway	96G0510	Ad	SO	09/17/96	CTC+no kid+dead 5 days
600	770		no	M	07	550 yards below Bar M Corner		LV	SO	09/17/96	Dead 7 days
590	745		no	M	07	Stone Trap below Bar M Driveway		LV	SO	09/05/96	CTC+dead 4 days
840	1090		no	M	08	Lower Stage Coach	96G0232	Ad	SO	09/05/96	died today-KD sample
650	825		no	M	08	Below Stage Coach Corner	96G0514	Ad	SO	09/17/96	CTC+no kid
710	840		no	M	08	New Dike to Stage Coach		LV	SO	09/25/96	CTC Dead 5+ days EH
640	800		no	M	08	New work dike below Bar M		LV	SO	09/17/96	CTC
570	700		yes	M	07	500 yards below Bar M		NM	SO	09/05/96	CTC+_dead 3 days
640			no	M	07	225 yards below Bar M driveway		UC	SO	08/29/96	Dead 1 day
530	645		no	M	07	Stone Trap below Bar M Driveway	96G0511	Ad+RV	SO	09/17/96	No kid+dead 5 days
645	795		no	M	07	Below Stone Trap below Bar M		LV+UC	SO	09/05/96	Dead 3 days
460	565		no	M	07	500 yards below Bar M		RV	SO	09/05/96	CTC+dead 4 days
445	530		no	M	07	Stone Trap below Bar M Driveway		RV	SO	09/05/96	CTC+dead 3 days
445	535		no	M	07	Stone Trap below Bar M Driveway		RV	SO	09/05/96	CTC+dead 2 days
420	525		no	M	07	Stone Trap below Bar M Driveway		RV	SO	09/05/96	CTC+dead 2 days
405	505		no	M	07	Stone Trap below Bar M Driveway		RV	SO	09/17/96	CTC+dead 5 days
640	820		no	M	07	Stone Trap below Bar M Driveway		LV	SO	09/05/96	CTC+ dead 3 days
635	765		no	M	08	New Dike to Stage Coach		LV	SO	09/25/96	CTC Dead 5+ days EH
630	810		no	M	08	Above Beaver Farm		LV	SO	09/17/96	CTC
675	805		no	M	07	Below Stone Trap below Bar M		LV	SO	09/05/96	CTC+dead 5 days
690	870		no	M	07	Stone Trap below Bar M Driveway	96G0509	Ad	SO	09/17/96	CTC+dead 5 days+no kid
560	715		no	M	08	A-Frame Gulch		LV	SO	09/17/96	CTC
405			no	M	07	100 yards below Bar M Dam		RV	SO	09/04/96	NCP
820	1005		no	M	07	Below Bar M Corner	96G0529	Ad	SO	09/09/96	
700	875		yes	M	07	Below Stage Coach Corner		NM	SO	09/17/96	CTC+scales

Table G-5. Continued

MEHF	FL	SC&S	Sex	Area Code	Area Sampled	Tag Code	Marks	spawning status	Date	Remarks
645	800	yes	M	07	Stone Trap below Bar M Driveway		NM	SO	[illegible]	CTC
675	820	no	M	07	Below Bar M Corner		LV	s o	09/09/96	
430	510	no	M	06	Below dike below Bar M		RV	s o	09/05/96	CTC dead 1 day
675	860	no	M	07	Stone Trap below Bar M Driveway	96G0229	Ad	s o	09/05/96	CTC + dead 3 days
675	a35	no	M	07	Stone Trap below Bar M Driveway		LV	s o	09/05/	CTC + dead 3 days
615	760	no	F	08	New work dike below Bar M		?	?	09/17/96	CTC
655	830	"Cl	M	07	Below Bar M corner	9660530	AD	?	09/09/96	Channel 13, Code 95
690	875	no	M	07	300 yards below Bar M Corner		LV	?	09/09/96	
655	840	yes	M	07	Below Bar M corner		NM	?	09/09/96	
635	780	no	M	07	Below Bar M corner		LV	?	09/09/96	
705	665	no	M	07	Below Ear M Corner		LV	?	09/09/96	
570		no	M	11	Gravel Pit		LV	partial	09/12/96	CTC + dead 4 days
560	760	no	M	11	Gravel Pit to Fred Gray's Br.		LV	partial	09/25/96	CTC Dead 5 + days EH
620	740	no	M	11	Clark White's Bridge		LV	Partial	09/06/96	CTC + dead 5 days
625		no	M	11	Upper New House		LV+UC	Partial	09/12/96	Dead 4 days
640	615	no	M	11	Upper New House		LV	Partial	09/12/96	CTC + bad gills
550	690	no	M	11	Habitat structures at Williams		?	Partial	09/12/96	NCP + dead 2 days
675	8 6 5	n o	M	11	Below Habitat structures at Williams		LV	Partial	09/12/96	NCP + dead 2 days
755	960	no	M	11	150 feet below gage		nv	Partial	09/12/96	NCP + dead 2 days
675	845	no	M	11	Lower New House		LV+UC	Partial	09/12/96	Dead 2 days
610	750	no	F	11	new house above Fred Gray's	96G0241	Ad	PM	09/06/96	CTC + dead 2 days + bad gills + KD sample
630	780	no	F	09	150 yards below Pig Head Bridge	96G0239	Ad	PM	09/06/96	CTC + dead 4 days + bad gills
605	750	no	F	11	Below Habitat structures at Williams		LV	PM	09/12/96	CTC+died today
660	745	no	F	11	Below William's Hole		LV	P M	09/20/96	
655	810	no	F	09	1 mile below Larson's Driveway		LV+UC	PM	08/16/96	Dead 5 days- Bad Gills
650	775	no	F	11	new house below rock quarry		LV	PM	09/20/96	
640	820	no	M	11	Lower New House	96G0259	Ad	P 2 M	09/12/96	y s - K D s a m p l e - N C P
690	850	no	M	11	Gravel Pit–William's	96G0240	Ad+LV	P M	09/06/9	CTC + dead 1 day + KD sample
605		no	M	11	E. Williams		LV	PM	09/12/96	NCP
660	820	no	M	11	Clark White's Bridge		LV	PM	09/06/96	CTC + dead 6 days
660	860	no	M	11	80 yards below gage		LV	PM	09/12/96	NCP+bad gilts
675	845	no	M	11	100 yards below gage at William's		LV	PM	09/06/96	CTC + dead 5 days
425	535	no	M	09	Lower HESHE		RV	RM	09/12/96	NCP + dead 1 day + bad gills
440	550	no	M	11	Gravel Pit–William's		RV	P M	09/06/9	CTC + dead 5 days
465		no	M	11	80 yards below gage		RV	PM	09/12/96	CTC
440	540	no	M	10	Home made fence		RV	PM	09/06/96	NCP + Dead 1 week
Adult		no	?	11	Larson's to Fred Gray's Bridge		?	PM	08/01/96	
635	780	no	F	11	new house above Fred Gray's		LV	R10	09/06/96	CTC + dead 2 days
620	780	no	F	11	LoBridge		LV+UC	R100	09/12/96	Dead 2 days
630	760	no	F	11	50 feet below Gage-EW		LV	R20	09/20/96	
640	790	no	F	10	London Bridge		LV	R200	09/06/96	C T C
585	750	no	F	11	new house above Fred Gray's		LV	R30	09/06/96	CTC + dead 2 days
645		no	F	11	Upper New House		LV	R400	09/12/96	CTC + bad gills + dead 5 days
695	850	no	F	11	Upper New House		LV+UC	R400	09/12/96	Dead 3 days
665		no	F	11	Habitat structures at Williams		LV	R50	09/12/96	CTC + dead 4 days
610	750	no	F	11	100 yards above Fred Gray's Bridge	96G0242	Ad+UC	R500	09/06/96	Died today + KD sample
640	775	no	F	11	50 feet below Gage–EW		LV	SO	09/20/96	
640	790	no	F	11	50 yards below Gage–EW	96G0119	Ad	SO	09/20/96	
630	730	no	F	10	Home made fence		LV	SO	09/06/96	CTC + dead 1 week +
640	750	no	F	11	260 yards below gage at William's		LV	SO	09/06/96	CTC + dead 2 days
640	770	no	F	11	Upper New House	96G0258	Ad	SO	09/12/96	CTC
640	760	no	F	11	20 yards below New House-FGB		LV	s o	09/20/96	
655	710	no	F	11	Upper new house above FGB	9600120		s o	09/20/96	
645		no	F	11	150 feet below gage		LV	s o	09/12/96	NCP+ dead 2 days
645	765	no	F	11	Emmitt Williams		LV	s o	09/24/96	CTC
650	765	no	F	11	50 yards above bridge–FG	96G0122	AD	s o	09/20/96	
660		no	F	11	80 yards below gage		LV	SO	09/12/96	NCP
665		no	F	11	100 yards below Clark White's Bridge		LV	s o	09/06/96	CTC + Dead 5 days
650		no	F	09	150 yards below Tuna Corner		LV	s o	09/12/96	NCP + dead 2 days + bad gills

Table G-5 Continued

MEHF	FL	Scales	sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remarks
635	740	no	F	09	Corner above Dubalskis		LV	s o	09/06/96	CTC + dead 7 days
625	640	no	F	09	Below Larson's		LV	s o	09/06/96	CTC + dead 3 days
620	735	no	F	09	Just below Larson's		LV	s o	09/06/96	CTC+ dead 1 day
545	685	no	F	11	Gravel Pit to Fred Gray's Br.		LV	s o	09/25/96	CTC Dead 2+ Days EH
570	715	no	F	11	50 feet below Gage-EW		LV	s o	09/20/96	
610	740	no	F	11	100 yards below gage at William's		LV	s o	09/06/96	CTC + dead 5 days
605	730	no	F	11	50 yards above bridae-FG		LV	SO	09/20/96	
620	755	no	F	11	Below Habitat structu res at Williams	9600257	Ad	s o	09/12/96	CTC + dead 6 days
620		no	F	11	Upper New House		LV	s o	09/12/96	CTC + dead 2 days
620	745	no	F	11	-William's		LV	s o	09/06/96	CTC + dead 6 days
610	770	no	F	11	50 yards above bridge-FG	9600121	AD	SO	09/20/96	
610		no	F	11	E. Williams-		LV	s o	09/12/96	CTC + dead 2 days
590		no	F	11	Gravel Pit		LV	s o	09/12/96	CTC + dead 3 days
580	705	no	F	11	70 yards above bridge-FG		LV	SO	09/20/96	
620	760	no	F	11	Below Habitat structures at Williams		LV	s o	09/12/96	NCP + dead 2 days
635	730	no	F	11	100 yards below Clark White's Bridge		?	SO	09/06/96	CTC + dead 1 week+
605		no	F	09	200 yards below Tuna Corner		LV+UC	s o	09/12/96	dead 5 days
630	780	no	F	11	London Bridge	96G0256	Ad	SO	09/12/96	CTC
630	800	no	F	11	Habitat structures at Williams		LV+UC	s o	09/12/96	Dead 3 days
630	755	no	F	11	Below Rock Quarry		LV	s o	09/20/96	
630	815	no	M0	9	100 yards below Tuna Corner		LV	s o	09/12/96	NCP + dead 5 days
630		no	M	11	Gravel Pit		LV	s o	09112196	NCP + dead 2 days
450	565	no	M	11	50 .feet below Gage-EW		RV	SO	09/20/96	
685	870	no	M	11	50 feet below Gage-EW		LV	SO	09/20/96	
660	840	no	M	09	Eelow Larson's		LV	SO	09/12/96	CTC + dead 1 week
635	810	no	M	11	Below Rock Quarry		LV	SO	09/20/96	
660	830	no	M	11	Gravel Pit to Fred Gray's Br.		LV	SO	09/25/96	CTC Dead 4+ Days EH
643	820	no	M	11	Gravel Pit to Fred Gray's Br.		LV	SO	09/25/96	CTC Dead 4+ Days EH
635	795	no	M	11	40 yards below New House- FGB		LV	SO	09/20/96	
655	830	no	M	11	50 yards above Fred Gray's Bridge	96G0260	Ad	SO	09/12/96	Dead 3 days-small ad-KD sample
620	765	no	M	11	50 yards below Gage-EW		NM	SO	09/20/96	
630	790	no	M	11	150 feet below gage		LV	SO	09/12/96	CTC + dead 1 week
680	870	no	M	09	Corner above Dubalskis		LV	SO	09/12/96	CTC + dead 5 days
440		no	M	11	Upper New House		RV	SO	09/12/96	CTC + dead 4 days
635		no	M	11	Below Habitat structures at Williams		LV	SO	09/12/96	CTC + dead 5 days
630	755	no	F	10	London Bridge		LV	?	09/06/96	CTC + dead 7 days
655	800	no	M	11	Upper new house above FGB		LV	?	09/20/96	
605		no	M	11	75 yards above E. Williams		LV	?	09/12/96	NCP + dead 1 week+
Adult		no	M	09	Corner above Dubalskis		?	?	09/06/96	old mort
660	840	no	M	12	35 yards above RST-FG		LV+UC	partial	09/10/96	
670	845	no	M	12	100yards above Meacham Con		LV	partial	09/10/96	
				12			LV	partial	09/10/96	CTC
790	995	no	M	12	RST hole-site2		RV	partial	09/10/96	NCP
630	790	yes	M	12	25 yards below intake		NM	partial	09/10/96	
645		no	M	12	Just above RST Fred Gray's		LV+UC	Partial	09/16/96	
655	845	no	M	12	Imeques		LV	Partial	09/03/96	
620	800	no	M	12	250 yards below Imeques		LV	Partial	09/03/96	
620	790	no	M	12	Below intake-Fred Gray's	96G0263	Ad+UC	Partial	09/16/96	
670	860	no	M	12	Just above RST Fred Gray's	96G0262	Ad	Partial	09/16/96	NCP
600	770	no	M	12	Above Meacham Con.		LV	Partial	09/16/96	CTC
780	980	no	M	12	Near RST FG	96G0270	Ad	Partial	09/16/96	NCP
590		no	M	12	Above Meacham Con.		NM	Partial	09/16/96	CTC
740	895	no	F	12	150 yards below Imeques		LV	PM	09/M/96	
635	755	no	F	12	125 yards below Imeques		LV	PM	09/W/96	
795	890	yes	F	12	.2 miles below Fred Gray's Bridge			PM	06/18/96	Hear
590	725	no	F	12	Imques Site		LV	PM	07/09/96	Gaff Wound
620	720	no	F	12	100 yards above Meacham Creek Con.		LV	PM	08/01/95	3 puncture wounds
620	760	no	F	12	100yards above Meacham Con		LV+UC	PM	09/10/96	
630		yes	m	12	100 yards below Fred Gray's release ramp		LV+UC	PM	06/16/96	Gaff mort-signs of additional take- blood cm bank-Sear also sampled this fish on 06/18/96

Table G-5 Continued

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remarks
630		no	M	12	Below intake–Fred Gray's		LV	PM	09/16/96	NCP
810	1030	no	M	12	Fred Gray's RST Site	96G0212	Ad	PM	08/27/96	Died today–bad gills
685	875	no	M	12	200 yards below RST–FG	96G0244	Ad	PM	09/10/96	bad gills–NCP–KD sample
Adult		no	M	12	225 yards below release ramp–FG		Ad	PM	08/13/96	Head eatten– dead 1 week+–couldn't tell caudal
680	860	no	M	12	25 yards below intake	96G0545	Ad	PM	09/10/96	CTC
660	865	no	M	12	10 yards below intake	96G0245	Ad	PM	09/10/96	KD–CTC
640	780	no	?	12	50 yards above rotary trap site		?	PM	08/13/96	old mort–Bear already sampled???
730		no	F	12	Intake–Fred Gray's	96G0267	Ad	R10	09/16/96	
630		no	F	12	20 yards above intake–FG		RV	RIO	09/16/96	C T C
635		no	F	12		--	LV	R10	09/10/96	CTC
		no			Just above Intake- Fred Gray's		NM+UC	R1000	09/16/96	
630		no	F	12	FG-Meacham Con.		LV	R15	09/20/96	C T C
595		no	F	12	Above Meacham Con.		LV+UC	A150	09/16/96	
580	685	no	F	12	Imeques		LV	R1600	09/03/96	
610		no	F	12	70 yards below Fred Gray's Bridge		LV	R20	09/16/96	C T C
605		no	F	12	Just above RST Fred Gray's		LV	R200	09/16/96	CTC
590		no	F	12	125 yards above RST-FG		LV	R30	09/10/96	C T C
625		no	F	12	Just above Intake- Fred Gray's	9600264	Ad	R300	09/16/96	C T C
665	620	no	F	12	125 yards above AST-FG		LV	R35	09/10/96	N C P
610	745	no	F	12	Imeques		LV	R40	09/03/96	
590	710	no	F	12	FG-Meacham Con.	9660527	Ad	A40	09/20/96	C T C
635	755	no	F	12	Imeques		LV	R40	09/03/96	
635		no	F	12	FG-Meacham Con		LV	R75	09/20/96	CTC
595		no	F	12	Below Fred Gray's Bridge		LV	R8	09/16/96	CTC
645	750	"Cl	F	12	FG-Meacham Con	96G0523	Ad	s o	09/20/96	CTC
590		no	F	12	Near RST FG		LV	s o	09/16/96	C T C
590	705	no	F	12	Imeques		LV	s o	09/03/96	
640	770	no	F	12	100 yards below Fred Gray's Bridge		LV+UC	s o	09/10/96	
620		no	F	12	FG-Meacham Con		LV	s o	09/20/96	CTC-Deformed back
645		no	F	12	Above Meacham Con.		LV	s o	09/16/96	C T C
565		no	F	12	Near RST FG		LV	s o	09/16/96	C T C
590	730	no	F	12	Near RST FG	96G0268	Ad	s o	09/16/96	C T C
650		no	F	12	RST hole-site2	9600248	Ad	s o	09/10/96	
660		no	F	12	200 yards below AST-FG		LV	s o	09/10/96	C T C
610		no	F	12	Just above RST Fred Gray's	9600261	Ad	s o	09/16/96	
590		no	F	12	Above Meacham Con.		LV	SO	09/16/96	NCP
655		no	F	12	Above Meacham Con.		LV	s o	09/16/96	C T C
630		no	F	12	Intake-Fred Gray's		LV	s o	09/16/96	C T C
630		no	F	12	FG-Meacham Con.		Ad	s o	09/20/96	snout gone-CTC
660		no	M	12	Near RST FG		LV	s o	09/16/96	C T C
665	690	no	M	12	150 yards above Imeques		LV	s o	09/03/96	
675		no	M	12	200feet below RST– FG		LV	s o	09/10/96	NCP
670		no	M	12	Below Fred Gray's Bridge		LV	s o	09/16/96	NCP
600		no	M	12	Just above Intake- Fred Gray's	96G0265	Ad	s o	09/16/96	C T C
670		"Cl	M	12	Intake-Fred Gray's		LV	s o	09/16/96	C T C
665		no	M	12	Below Fred Gray's Bridge		LV	s o	09/16/96	CTC
610		no	M	12	70 yards below Fred Gray's Bridge		LV	s o	09/16/96	C T C
660	650	no	M	12	Near RST FG	96G0269	Ad	s o	09/16/96	N C P
415		-no-	M	12	Below intake-Fred Gray's		RV	s o	09/16/96	N C P
610	690	no	F	12	150 yards below Imeques Inlet		?	?	09/W/96	
670	665	no	M	14	Just above Squaw Creek	9660277	Ad	Partial	09/16/96	C T C
660		no	M	14	Just above Squaw Creek		LV	Partial	09/16/96	NCP
660		no	M	14	Just above Squaw Creek		LV	Partial	09/16/96	NCP
670	640	no	M	14	300 yards above Squaw Creek		LV	Partial	09/03/96	
655	640	no	M	13	350 yards below Meacham Con.		?	Partial	09/16/96	CTC
610		no	M	13	Gibbon Area		LV	Partial	09/16/96	C T C
690	880	no	M	13	below Meacham Con		LV	Partial	09/03/96	
610	755	no	F	14	Gibbon AR Siding		LV	PM	08/27/96	Dead 1 day-bad gills- CTC
660	600	no	F	13	475 yards below Meacham Con.		LV	PM	09/03/96	

Table G-5 Continued

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	Spawning Status	Date	Remarks
630	750	no	F	14	.2 miles above Squaw Creek Con.-		NO	PM	07/10/96	
620	750	no	F	14	Lower Gibbon		LV+UC	PM	08/27/96	Dead 6 days
565	680	no	F	14	1.1 miles below Meacham Con.		LV	PM	09/03/96	
670	855	no	F	13	Upper Gibbon RR Siding		LV	PM	09/10/96	NCP
690	850	no	F	13	Gibbon RR Siding		LV	PM	09/10/96	NCP
605	750	no	F	14	Gibbon		LV	PM	08/20/96	CTC – Dead 1 week
610	770	no	F	14	Gibbon RR Siding		LV	PM	08/27/96	Dead 1 week-CTC
665	855	"Cl	F	13	Gibbon RR Siding		LV	PM	09/10/96	NCP+ bad gills
595	725	no	F	14	Lower Gibbon		LV	PM	08/27/96	Dead 4 davs – NCP – Bad gills
610	750	n	o	14	Gibbon RR Sidino		LV+UC	PM	08/27/96	dead 5 davs – good gills
630	760	no	F	14	New House by Squaw Creek		LV	PM	09/10/96	NCP
635	770	no	F	13	150 yards below old Meacham Confluence		LV	PM	08/27/96	Died today-bad gills – NCP
655	a25	no	F	14	Just above Squaw Creek	9660276	AD+UC	PM	09/16/96	
645	790	no	F	14	Lower Gibbon		LV	PM	08/27/96	NCP-left side of head fungused+left gill-Dead 1 day
590	725	no	F	13	300yards below Meacham Con.		LV	PM	09/03/96	
710	820	yes	F	14	Above Squaw Creek	96G0110	Ad	PM	07/10/96	Tip nose only
665	820	no	F	14	Lower Gibbon	9660213	Ad	PM	08/27/96	Dead 4 days – Bad Gills-NCP
630	775	"0	F	14	Gibbon RR Siding		LV+UC	PM	08/27/96	Dead 2 days- bad gills
595	730	no	F	13	350 yards below Meacham Con.		LV	PM	09116196	CTC
550	660	no	F	13	80 yards below Meacham Con.	96G0426	Ad	PM	????	DT – GS
585	720	no	F	13	Upper Gibbon RR Siding	96G0252	Ad	PM	09/10/96	CTC
635		no	F	14	New house corner above Squaw Creek	96G0427	Ad	PM	08/13/96	Bad gills – dead 5 days
630	780	no	F	14	Gibbon		LV+UC	PM	08/20/96	Dead 1 day
595	715	no	F	13	1.0 miles below Meacham Con.	96G0504	Ad	PM	09/03/96	
655	835	no	M	14	Lower Gibbon		LV	PM	08/27/96	Dead 4 days – NCP – gills OK
630	795	no	M	14	New House above Squaw Creek	96G0272	Ad	PM	09/16/96	CTC
675	865	yes	M	14	.1 miles above Squaw Creek Con.	96G0109	Ad	PM	07/10/96	
610	790	no	M	14	Just above Squaw Creek		LV	PM	09/10/96	NCP + bad gills
635	800	no	M	14	Gibbon	96G0204	Ad	PM	08/20/96	Dead 1 day-Bad Gills- Shaker Injury-NCP
555	670	no	M	14	Lower Gibbon		LV	PM	08/27/96	Dead 1 week
690	900	no	M	13	Gibbon RR Siding		LV	PM	09/10/96	NCP
680	880	no	M	13	Below Meacham Con	9600250	Ad	PM	09/10/96	NCP
650	835	no	M		Gibbon RR Siding		LV	PM	09/10/96	CTC
625	805	no	M	13	Gibbon RR Siding		LV	PM	09/10/96	NCP
630	780	no	M	13	120 yards below Meacham Creek Con.		LV	PM	08/01/96	2 puncture wounds
630	790	no	M	13	Gibbon RR Siding	96G0253	Ad	PM	09/10/96	CTC
635	610	no	M	13	200yards below old Meacham Con.	9660249	Ad	PM	09/10/96	NCP
560	700	no	M	13	Upper Gibbon RR Siding		LV	PM	09/10/96	CTC
670	845	no	M	13	Below Meacham Con.	96G0271	Ad	PM	09/16/96	
640	840	no	M	14	Just above Squaw Creek		LV	PM	09/10/96	NCP
Adult		no	?	14	150 yards below new house corner above Squaw Creek		?	PM	08/13/96	Bear sampled?
620	760	no	F	13	Gibbon RR Siding		LV	R100	09/10/96	NCP
665		no	F	14	Just above Squaw Creek		NM	R125	09/10/96	CTC
670		?	F	14	New House above Squaw Creek		NM	R20	09/16/96	CTC
595	730	?	F	14	Just above Squaw Creek		LV+UC	R200	09/10/96	
605	750	no	F	13	200 yards below Meacham Con		LV	R200	09/10/96	CTC
655		no	F	13	Meacham Con to 3.0 miles downstream		LV	R250	09/23/96	CTC
660	800	no	F	14	New House by Squaw Creek		LV	R300	09/10/96	CTC
610	745	no	F	14	New House by Squaw Creek	96G0254	Ad	R75	09/10/96	NCP
610		no	F	13	400 yards below old Meacham Con		LV	s o	09/10/96	CTC
620		no	F	13	Below Meacham Con.		LV	s o	09/16/96	CTC
620	755	no	F	13	Below Meacham Con.	96G0266	Ad	s o	09/16/96	
610		no	F	13	Meacham Con to 3 0 miles downstream		LV	s o	09/23/96	CTC
585	720	no	F	13	Meacham Con		LV	s o	09/10/96	NCP
765		no	F	13	Meacham Con to 3.0 miles downstream		LV	s o	09/23/96	CTC
630		no	F	13	Gibbon Area		LV	s o	09/16/96	CTC
635	740	no	F	13	Meacham Con to 3.0 miles downstream	9600626	Ad	s o	09/23/96	CTC
660	800	no	F	13	Upper Gibbon RR Siding	96G0251	Ad	s o	09110196	CTC
670		no	F	13	Meacham Con to 3.0 miles downstream		LV	s o	09/23/96	CTC

Table G-5 Continued

MEHF	FL	Scales	sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remark
695		no	F	13	Gibbon Area		BV	SO	09/16/96	CTC
650		no	F	13	Upper Gibbon RR Siding		LV	SO	09/10/96	CTC
660	815	no	F	13	Gibbon Area	96G0273	Ad	SO	09/16/96	CTC+KDsample
600	770	no	M	13	Just below Meacham Con.	96G0503	Ad	SO	09/03/96	
685	790	no	M	13	Meacham Con to 3.0 miles downstream	96G0547	Ad	SO	09/23/96	CTC
665		no	M	13	Meacham Con to 3.0 miles downstream		LV	SO	09/23/96	NCP
655	805	no	M	13	Meacham Con to 3.0 miles downstream	96G0524	Ad	SO	09/23/96	NCP
660		no	M	13	Below Meacham Con		LV	so	09/16/96	NCP
700	910	no	M	13	Upper Gibbon RR Siding		LV	SO	09/10/96	NCP
735	885	no	M	13	Meacham Con to 3.0 miles downstream		LV	SO	09/23/96	CTC
645	795	no	M	13	Meacham Con to 3.0 miles downstream	96G0288	Ad	SO	09/23/96	CTC
805		no	M	13	Meacham Con to 3.0 miles downstream		RV	SO	09/23/96	CTC
735	930	no	M	13	Gibbon Area		LV	SO	09/16/96	CTC
670		no	M	13	Meacham Con to 3.0 miles downstream		?	?	09/23/96	CTC-old mort
640	750	yes	F	16	Weather's-DW	96G0612	Ad	PM	06/??/96	
650	800	no	M	15	.3 miles below Squaw Creek Con.		LV	Partial	09/17/96	
1615	750	no	M	15	.4 miles below Squaw Creek Con.		LV	Partial	09/17/96	
620	795	yes	M	16	1.0 miles above Thornhollow Bridge		NM	Partial	09/04/96	
675	630	no	M	15	200 yards below Squaw Creek	96G0148	Ad	Partial	09/17/96	
665	645	no	M	15	200 yards below Squaw Creek		LV	Partial	09/17/96	
Adult		no	F	15	Tire Dike		?	PM	08/27/96	Can't tell marks
665	830	no	F	15	Tire Dike	96G0428	Ad+UC	PM	08/14/96	Abcess at origin of LV- gills excellent- died today
720	880	no	F	15	Lower Wither's		RV	PM	08/20/96	Dead 1 day-NCP-Bad Gills
680	640	yes	F	15	1.0 miles below Squaw Creek Con.		LV	PM	07/22/96	Gaff Mort- 1 day old
605	975	yes	I	15	.1 miles below Squaw		NM	PM	09/10/96	
670	620	no	F	15	Upper Wither's		LV	PM	08/27/96	Died today-Bad Gills-NCP
610	750	no	F	16	Wither's		LV+UC	PM	08/27/96	Dead 4 days-Bad Gills
650	805			15	Wither's		LV+UC	PM	08/20/96	Dead 1 day-Bad Gills
645	615	no	F	15	mile .9 below Squaw Creek Con.		LV	PM	09/10/96	
645	770	no	F	15	mile 1.2 below Squaw Creek Con.		LV	PM	09/10/96	
645	775	no	F	15	Squaw to Thornhollow Bridge	9660116	Ad	PM	09/04/96	
640	790	no	F	15	Squaw to Thornhollow Bridge		LV	PM	09/04/96	
560	720	no	F	15	Upper Wither's	96G0206	AD+LV	PM	08/20/96	Radio Tag# Channel 13, code 36 -good gilk bruise behind opercle
640	790	no	F	15	400 yards below Squaw		LV	PM	09/10/96	
635	775	no	F	16	400 yards above Thornhollow RR Bridge		LV+UC	PM	08/20/96	
635	770	no	F	16	Wither's		LV	PM	08/27/96	Dead 2 days-NCP-Bad gilk
Adult		no	F	16	Wither's		pelvic	PM	07/21/96	reported by swimmer- taken for eggs
725	890	yes	F	16	Wither's		NO	PM	08/27/96	Dead 2 days-Bad Gills
				16	Wither's		LV	PM	08/27/96	Dead 5 days-NCP
645	775	no	F	16	Wither's Hole		LV+UC	PM	08/14/96	Bad gills- died yesterday
Adult		no	F	15	Tire Dike		?	PM	08/27/96	Bad Gills-NCP-Can't tell marks
Adult		no	F	16	5 miles above Thornhollow Bridge		??	PM	08/06/96	dead 1 week+, couldn't tell marks except ad was present
635	760	no	F	16	200 yards above Thornhollow Bridge	96G0216	Ad	PM	08/27/96	Dead 1 day-Bad Gills-NCP
625	760	no	F	16	Wither's			PM	08/06/96	liver had many spots of red, BB to pencil eraser size,bruise on right side, flesh on inside by bruise br
620		no	F	16	Wither's				08/27/96	Dead 4 days-NCP
615		no	F	16	lower Wither's				08/06/96	couldn't tell about caudal clip, dead 1 week+
615	745	no	F	16	.4 miles above Thornhollow Bridge				08/06/96	possible gaff mort, dead 5 days
640	790	no	F	16	200 yards above Thornhollow Bridge				09/10/96	
640	785	no	F	15	Wither's		LV-Radio	PM	08/06/96	antenna made abcess on left side- swollen silver dollar size, died today
575		yes	F	15	100 yards above Tire Dike		NO	PM	08/20/96	Dead 1 week- Bads Gills- NCP
640	790	no	F	15	Squaw to Thornhollow Bridge	96G0112	Ad	PM	09/04/96	K CI sample
595	745	no	F	15	200 yards below Ben Roush		LV+UC	PM	08/27/96	Dead 2 days-Radio channel 7,code 88
620	750	no	F	15	Squaw to Thornhollow Bridge	96G0113	Ad	PM	09/04/96	No KD sample
615	760	no	F	15	125 yards below Squaw Creek Con.		LV+UC	PM	08/27/96	Dead 1 week- bad gilk
625	760	yes	F	15	Below Squaw Creek		NO	PM	07/22/96	
625		no	F	15	300 yards below Ben Roush's RST Site		?	PM	08/20/96	
605		no	F	15	Lower end of Tire Dike		LV	PM	08/20/96	Dead 5 days-Bad Gills- CTC
620	775	no	F	15	Wither's		LV	PM	08/20/96	NCP-Bad Gills
610	755	yes	F	15	2 miles below Squaw Creek		LV	PM	06/20/96	

Table G-5 Continued

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remarks
620	765	no	F	15	Squaw to Thornhollow Bridge	96G0117	Ad	PM	09/04/96	KD taken
620	770	no	F	15	Squaw to Thornhollow Bridge		LV	PM	09/04/96	
620	770	no	F	15	mile 2.0 below Squaw Creek Con.	96G0156	Ad	PM	09/10/96	No KD sample
595	740	no	F	15	.2 miles below Squaw Creek	96G0151	Ad	PM	07/22/96	Tip of nose only
595	725	no	F	15	Below Ben Roush's	96G0205	Ad+UC	PM	08/20/96	Dead 1 week–Bad Gills
630	770	no	F	15	Upper Wither's		LV+UC	PM	08/06/96	bad gills, dead 4 days
580	710	no	F	15	Upper Wither's		LV	PM	08/20/96	Bad Gills– NCP
630	760	no	F	15	Trailer Corner		LV	PM	08/20/96	Dead 1 week+ + –CTC
635	780	no	F	15	Squaw to Thornhollow Bridge		LV	PM	09/04/96	
605	750	no	F	15	Squaw to Thornhollow Bridge		LV	PM	09/04/96	
600	770	no	M	15	Squaw Creek Con.		LV+UC	PM	08/20/96	Dead 3 days– Bad Gills
635	825	no	M	15	1.3 miles below Squaw Creek		LV	PM	09/17/96	
725	905	no	M	15	Upper Wither's	96G0207	Ad+UC	PM	08/20/96	Bad Gills
Adult		no	M	15	Below Squaw Creek		?	PM	07/22/96	
Adult		no	M	16	Thornhollow Bridge		?	PM	08/20/96	NCP–Ad present– pelvic fins couldn't see– partially eatten by dog
655	825	yes	M	15	Mouth of Squaw Creek	96G0108	Ad	PM	07/10/96	
630	800	no	M	15	Lower Wither's	96G0208	Ad	PM	08/20/96	NCP
645	825	no	M	15	Squaw to Thornhollow Bridge		LV	PM	09/04/96	
670	860	no	M	15	Upper Wither's		LV	PM	08/27/96	Dead 1 day–CTC–gills fair
735	890	no	M	16	20 yards above Thornhollow Bridge		LV	PM	09/17/96	
665	845	no	M	15	Squaw to Thornhollow Bridge	96G0114	Ad	PM	09/04/96	KD sample
680	870	no	M	15	Squaw to Thornhollow Bridge		LV	PM	09/04/96	
640	745	no	?	15	.1 miles below Squaw Creek Con.	96G0150	Ad	PM	07/22/96	Tip of nose only
Adult		no	?	15	Trailer Corner		?	PM	08/20/96	Back bone only
660	770	no	F	16	Thornhollow B. to 1.75 miles upstream		LV	R10	09/23/96	Dead 3 days
665	795	no	F	15	.9 miles below Squaw Creek Con.		LV	R20	09/17/96	
605	745	no	F	15	Squaw to Thornhollow Bridge		LV	R20	09/04/96	
655	785	no	F	16	Just above Thornhollow Bridge	96G0145	Ad	SO	09/17/96	
610	740	no	F	15	.6 miles below Squaw Creek Con.		LV	SO	09/17/96	
630	760	no	F	16	20 yards above Thornhollow Bridge		LV	SO	09/10/96	
625	780	no	F	15	.25 miles below Squaw Creek Con.		LV	SO	09/17/96	
650	805	no	F	15	.6 miles below Squaw Creek	96G0155	Ad	SO	09/10/96	KD sample
665	795	no	F	15	1.7 miles below Squaw Creek Con.		LV	SO	09/17/96	
635	780	yes	F	15	.3 miles below Squaw		NM	SO	09/10/96	
640	745	no	F	15	.8 miles below Squaw Creek Con.		LV	SO	09/17/96	
635	795	no	F	15	.5 miles below Squaw		LV	SO	09/10/96	
630	775	no	F	15	300 yards below Squaw	96G0154	Ad	SO	09/10/96	
655	775	no	F	16	300 yards above Thornhollw Bridge		LV	SO	09/17/96	
660	810	no	F	15	mile .9 below Squaw Creek Con.		LV	SO	09/10/96	
620	785	no	F	15	.7 miles below Squaw Creek Con.	96G0146	Ad	SO	09/17/96	
625	735	no	F	15	.7 miles below Squaw Creek Con.		LV	SO	09/17/96	
590	700	no	F	15	.3 miles below Squaw Creek Con.		RV	SO	09/17/96	
710	845	no	F	15	Wither's		LV	SO	09/17/96	
685	845	no	M	16	Thornhollow B. to 1.75 miles upstream		LV	SO	09/23/96	Dead 1 day
670	885	no	M	16	500 yards above Thornhollow Bridge		LV	SO	09/17/96	
630	800	no	M	16	Thornhollow B. to 1.75 miles upstream	96G0284	Ad	SO	09/23/96	Dead 7 days
750	905	no	M	15	.5 miles below Squaw Creek		LV	SO	09/10/96	
685	865	no	M	15	mile 2.0 below Squaw Creek Con.		LV	SO	09/10/96	
655	805	no	M	15	Squaw to Thornhollow Bridge	96G0115	Ad	SO	09/04/96	No KD sample
645	865	no	M	15	Squaw to Thornhollow	96G0147	Ad	SO	09/17/96	
660	835	no	M	15	Squaw to Thornhollow Bridge	Snout eatten	Ad	SO	09/04/96	Snout eatten
625	795	no	M	15	mile .5 below Squaw Creek Con.		LV	SO	09/10/96	
640	800	no	M	16	Thornhollow B. to 1.75 miles upstream		LV	SO	09/23/96	Dead 5 days
605	785	no	M	15	.5 miles below Squaw Creek Con.		LV	SO	09/17/96	
500	640	no	M	16	Thornhollow B. to 1.75 miles upstream	96G0283	Ad+RV	SO	09/23/96	Dead 7 days
590	750	no	M	16	Thornhollow B. to 1.75 miles upstream	Head gone	Ad	?	09/23/96	Old
635	810	no	M	15	Squaw to Thornhollow Bridge		?	?	09/04/96	
695	835	no	M	15	1.2 miles below Squaw Creek Con.		LV	?	09/17/96	
600	710	no	?	16	Thornhollow B. to 1.75 miles upstream	Head gone	Ad	?	09/23/96	Dead 14 days

Table G-5 Continued

MEHF	FL	Scales	Sex	Area Code	Area Sampled	Tag Code	Marks	Spawning status	Date	Remark
620	790	yes	F	15	Umatilla River	96G0548	Ad	PM	07/22/96	PB–BS
660	795	yes	M	16	Wither's		?	PM	07/10/96	
620	775	no	F	17	Smithe House		LV	PM	09/03/96	
690	890	yes	M	15	Across from Russell's–DW	96G0546	Ad	PM	07/30/96	
620	790	no	F	15	Below Squaw Creek	96G0424	Ad+LV	PM	07/22/96	Add on
670	830	no	M	17	Below Thornhollow Bridge		LV	Partial	09/10/96	Scolosis–CTC
665	835	no	M	17	Thornhollow RR Bridge	96G0520	LV	Partial	09/18/96	NCP
										CTC
655		no	M	17	Downstream of upper dike below Thornhollow		LV	Partial	09/18/96	NCP
630		no	M	17	Downstream of upper dike below Thornhollow		LV	Partial	09/18/96	NCP
700	890	yes	M	17	.75 miles below Thornhollow Bridge		NM	Partial	09/04/96	
660	830	no	M	17	Below Thornhollow Bridge		LV	Partial	09/18/96	NCP
640	775	no	F	17	175 yards below Thornhollow Bridge		LV+UC	PM	08/28/96	
645	820	yes	F	17	100 yards below Thornhollow Bridge	96G0501	Ad	PM	08/28/96	
5	6 0	no	F	17	Downstream of upper dike below Thornhollow		LV	PM	09/18/96	CTC
640	795	no	F	17	.1 miles below Thornhollow Bridge		LV+UC	PM	09/04/96	
640	795	yes	F	17	Thornhollow Bridge		LV	PM	06/18/96	Bear
640	775	yes	F	17	75 yards below Thornhollow Bridge		LV	PM	08/28/96	
645		yes	F	17	BelowThornhollow Bridge		NM	PM	09/10/96	
655	795	no	F	17	BelowThornhollow Bridge		LV+UC	PM	08/20/96	
650	765	"Cl	F	17	2nd hole below Buckaroo		Lv	PM	08/14/96	no caudal punch- dead 5 days
650	775	no	F	17	175 yards below Thornhollow Bridge		LV+UC	PM	08/28/96	
650	795	yes	F	17	.3 miles below Thornhollow Bridge		NO	PM	08/20/96	
640	760	no	F	17	400 yards below Thornhollow Bridge	96G0152	Ad	PM	08/06/96	
655	765	no	F	17	400 yards Below Thornhollow Bridge		LV	PM	06/M/96	
Adult		no	F	17	Downstream of upper dike below Thornhollow snout eatten		Ad	PM	09/18/96	CTC-snout eatten
660	600	no	F	17	Antoine Minthorn's		LV+UC	PM	09/04/96	
665		no	F	17	Below Thornhollow Bridge		LV	PM	09/18/96	NCP-bad gills
760	930	no	F	17	Cauldwell's swim		RV+UC	PM	08/14/96	Gaff wound- raw flesh at origin of both pea- died yesterday
510		no	F	17	Below Thornhollow Bridge	Snout eatten	Ad	PM	09/10/96	
670	620	no	F	17	BelowThornhollow Bridge		LV	PM	09/10/96	CTC
615	735	yes	F	17	300 yards below Thornhollow Bridge	96G0502	Ad+UC	PM	08/28/96	
575		no	F	17	Below Thornhollow Bridge-upper dike		LV	PM	09/18/96	CTC
560	710	no	F	17	Thornhollow RR Bridge	9600521	Ad	PM	09/18/96	CTC
6		no	F	17	Below Thornhollow Bridge-upper dike		LV	PM	09/18/96	CTC
600	745	yes	F	17	200 yards below Thornhollow Bridge		LV	PM	08/28/96	
600	7io	no	F	17	Below Thornhollow Bridge		LV	PM	08/20/96	
610	740	no	F	17	Below Thornhollow Bridge		LV+UC	PM	08/20/96	
650		yes	F	16	Just above Louie's Fence		NM	PM	09/18/96	CTC
605	770	"Cl	F	16	Below Thornhollow RR Bridge		LV	PM	08/29/96	
620		no	F	17	Below Thornhollow Bridge-upper dike		LV	PM	09/18/96	CTC
625	765	no	F	18	Lower Thornhollow RR Crossing		LV	PM	07/23/96	
675	630	no	F	17	.4 miles BelowThornhollow Bridge		LV	PM	08/20/96	
620	750	no	F	18	Thornhollow RR Bridge	96G0423	Ad	PM	08/30/96	
620		no	F	17	Caldwell's		LV	PM	09/18/96	CTC
715	670	no	F	17	300 yards below Thornhollow Bridge	9600421	Ad	PM	07/10/96	Darryl
670	670	no	M	17	BelowThornhollow Bridge	96G0508	Ad	PM	09/10/96	Gaff Injury???
625		no	M	17	Thames		LV	PM	09/18/96	CTC
665	625	yes	M	17	Thornhollow Bridge			PM	06/18/96	Fish line and hook-Bear
660		no	M	17	Lower Caldwell's		BV	PM	09/18/96	NCP
610	750	no	M	17	Below Thornhollow Bridge		LV	PM	09/10/96	
575	775	no	M	18	.5 miles above Louie Dick's		LV	PM	08/07/96	
655	630	no	M	16	300 yards below Thornhollow RR crossing		LV	PM	07/23/96	
Adult		no	?	17	First hole below Buckaroo		?	PM	08/14/96	Skin and tail attached- Bearsampled??
620		no	F	18	Darryl's		LV	R100	09/18/96	CTC
620		no	F	17	BelowThornhollow Bridge		LV	R100	09/18/96	CTC
640	760	no	F	17	Below Thornhollow Bridge		LV	R200	09/10/96	CTC
610		yes	F	17	BelowThornhollow Bridge-upper dike		NM	R200	09/18/96	CTC
600	750	no	F	17	Upper Antone Minthorn's	9660517	Ad	R300	09/18/96	CTC

Table G-5. Continued

MEHF	FL	Scales	sex	Area Code	Area Sampled	Tag Code	Marks	spawning status	Date	Remarks
595	745	no	F	17	Downstream of upper dike below Thornhollow	96G0279	Ad	R350	09/18/96	CTC
620	760	no	F	17	Below Thornhollow Bridge	96G0507	Ad	R40	09/10/96	No KD sample
650	790	no	F	17	Below Thornhollow Bridge		LV	R400	09/10/96	CTC
640	800	no	F	18	Just above Louie's Fence	96G0522	AD	SO	09/18/96	CTC
650		no	F	17	Below Thornhollow Bridge--upper dike		LV	SO	09/18/96	CTC
630		yes	F	17	Antone Minthorn's		NM	SO	09/18/96	CTC
670		no	F	18	Darryl's		LV	SO	09/18/96	CTC
620		no	F	17	Downstream of upper dike below Thornhollow		LV	SO	09/18/96	CTC
635	765	yes	F	17	175 yards below Thornhollow Bridge		LV	SO	08/28/96	
620	765	no	F	17	Below Thornhollow Bridge		LV	SO	09/10/96	
610	790	no	M	17	Caldwell's	96G0278	Ad	SO	09/18/96	NCP
620		no	M	17	Antone Minthorn's		LV	SO	09/18/96	CTC
620	780	no	M	17	Below Thornhollow Bridge		LV	SO	09/10/96	CTC
670	865	no	M	17	Below Thornhollow Bridge		LV	SO	09/10/96	CTC
625	820	no	M	17	Upper Antone Minthorn's	96G0518	Ad+LV	SO	09/18/96	NCP
690	870	no	M	17	Below Thornhollow Bridge	96G0506	Ad	SO	09/10/96	No KD sample
660	850	no	M	17	Upper Antone Minthorn's	96G0519	Ad	SO	09/18/96	CTC
660	860	no	M	17	Below Thornhollow Bridge--upper dike	96G0280	Ad	SO	09/18/96	NCP
670	870	no	M	17	Below Thornhollow Bridge		LV	SO	09/10/96	CTC
670	860	no	M	17	Below Thornhollow Bridge		LV	SO	09/10/96	
645	800	no	F	19	across from Louie Dick's	96G0144	Ad	PM	09/18/96	KD sample
645	800	no	F	19	Louie Dick's		LV	PM	08/28/96	Dead 1 day - bad gills
630	740	no	F	20	75 yards above Cayuse RR Bridge		LV	PM	08/15/96	
620	765	no	F	20	100 yards above Cayuse RR Bridge		LV	PM	08/15/96	
665	785	no	F	19	200 yards above Cayuse Bridge		LV	PM	08/28/96	Dead 2 days-- NCP
665	785	no	F	19	.5 miles below Louie Dick's		Ad	PM	08/15/96	Snout was eatten
595	745	no	F	19	Louie Dick's		LV	PM	09/11/96	
550	680	no	F	19	Louie Dick's		LV	PM	09/11/96	
600	730	no	F	19	Louie Dick's		LV	PM	08/21/96	
595	735	no	F	19	200 yards above Cayuse Bridge		LV	PM	09/11/96	
615	765	no	F	19	Above new dike at Cayuse	96G0118	Ad	PM	09/18/96	
665	805	no	F	20	50 yards above Cayuse RR Bridge	96G0149	Ad	PM	08/15/96	
650		no	M	19	Louie Dick's Fence		LV	PM	08/28/96	Dead 1 week + CTC
685	915	no	M	19	Across from Louie Dick's	96G0505	Ad	PM	09/05/96	KD sample
715	800	yes	M	19	Below Louie Dick's		NO+UC	PM	08/21/96	
655	825	no	M	19	across from Louie Dick's		LV	PM	09/18/96	
640	760	no	M	19	100 yards above Cayuse Bridge		LV	PM	08/28/96	Dead 5 days--CTC
Adult		no	?	19	Louie Dick's		Ad	PM	08/28/96	Dead 1 week + old mort without head
Adult		no	?	19	Louie Dick's		?	PM	08/28/96	Dead 1 week++
625	770	no	F	19	Construction site above Cayuse	snout eatten	Ad	R2000	09/18/96	snout eatten
605	750	yes	F	19	275 yards below Louie Dick's old fence		NM	SO	09/18/96	
620	775	no	F	19	130 yards above Cayuse Bridge		LV	SO	09/18/96	
695	930	no	M	19	Louie Dick's		LV	SO	09/11/96	
630	790	no	M	19	Louie Dick's		LV	SO	09/11/96	
600	805	yes	M	19	Above new dike at Cayuse		NM	SO	09/18/96	
635	790	no	F	21	First hole below Cayuse RR Bridge	96G0217	Ad	PM	08/28/96	Dead 4 days-- bad gills
650		no	F	21	550 yards below Cayuse RR Bridge		LV	PM	08/21/96	Dead 5 days--NCP
630	770	yes	F	21	Below Cayuse Bridge		NM	PM	08/22/96	
630		no	F	21	800 yards below Cayuse Bridge		LV	PM	08/28/96	Dead 1 week-- CTC
590	720	no	F	21	First large hole below Cayuse RR Bridge		NO	PM	08/21/96	Dead 6 days--Gills OK-- NCP
620		no	F	21	350 yards below Cayuse RR Bridge			PM	08/07/96	Ad present-- no caudal clip-- couldn't see pelvic fins-- partially eatten-- dead 2 days
645	785	no	F	21	Minthorn		LV	PM	09/11/96	bad gills-- NCP
630	790	no	F	21	350 yards below Cayuse RR Bridge		LV+UC	PM	08/07/96	dead 5 days
650	795	no	F	21	Louie's (Case) Corner		LV+UC	PM	08/15/96	dead 5 days
660	810	no	F	21	200 yards below Cayuse RR Bridge		LV	PM	08/21/96	Dead 2 days--NCP--Bad Gills
Adult		no	F	21	600 yards below Cayuse RR Bridge		?	PM	08/21/96	Dead 1 week+ Couldn't see marks except Ad was present
625		no	F	21	350 yards below Cayuse RR Bridge		LV	PM	08/07/96	couldn't tell caudal-- dead 1 week++
580	700	no	F	21	600 yards above Minthorn Springs	96G0218	Ad	PM	08/28/96	Dead 1 Week+
620	770	no	F	21	Louie Case's	96G0255	Ad	PM	09/11/96	CTC

Table G-5. Continued

MEHP	FL	Scales	sex	Area Code	Area Sampled	Tag Code	Marks	Spawning Status	Date	Remarks
620	770	no	F	21	50 yards below Cayuse RR Bridge		LV+UC	PM	08/15/96	Good gills- body bruise- dead
615	730	no	F	21	Case's House		LV	PM	09/05/96	
595	735	no	F	21	hole on first corner below Cayuse RR Bridge		LV	PM	08/15/96	Dead 5 days- possible gaff mor
610	750	no	F	21	Louie's (Case) Corner		LV	PM	08/15/96	dead 5 days
610		no	F	21	.7 miles below Cayuse RR Bridge		LV	PM	08/15/96	CTC
620	760	no	F	21	hole on first corner below Cayuse RR Bridge		LV+UC	PM	08/15/96	Bad gills- dead 1 day
620	750	no	F	21	Minthorn		UC+?	PM	09/11/96	bad gills-CH 7,code 89
620	750	no	F	21	450 yards below Cayuse RR Bridge	96G0209	Ad+UC	PM	08/21/96	Dead 1 week+
620		no	F	21	hole on first corner below Cayuse RR Bridge		LV	PM	08/15/96	dead 5 days
650	800	no	M	21	Louie's (Case) Corner		LV	PM	08/15/96	
620	790	no	M	21	1 mile above Minthorn Springs		LV	PM	08/21/96	NCP-Dead 5 days
610	760	no	M	21	Cayuse RR bridge		LV	PM	08/07/96	
685	870	no	M	21	Louie's (Case) Corner	96G0430	Ad	PM	08/15/96	dead 5 days
650	825	no	M	21	Louie's (Case) corner		LV	PM	08/07/96	6 pencil eraser size bruises on l
640	820	no	M	21	First hole below Cayuse RR Bridge		LV	PM	08/28/96	Dead 5 days-NCP
620	790	no	M	21	hole on first corner below Cayuse RR Bridge		LV	PM	08/15/96	dead 1 day
640	810	no	M	21	hole on first corner below Cayuse RR Bridge	96G0429	AD	PM	08/15/96	Bad gills!!- anal fin split at orgir
645	820	no	M	21	Louie's (Case) corner	96G0425	Ad	PM	08/07/96	Bad gills- fungus by gills- no c
660	670	no	M	21	First large hole below Cayuse RR Bridge		LV	PM	08/21/96	Dead 2 days-NCP-3 holes throu
655	310		e		Cayuse RR Brid e s		LV	PM	06/27/96	
Adult		no	?	21	.7 miles below Cayuse RR Bridge		?	PM	09/11/96	
700	840	no	F	21	Minthorn- 1/2 mile above to 200m below		LV	R300	09/25/96	UCP, Retained 300 eggs, died t
675	860	no	M	21	Minthorn- 1/2 mile above to 200m below		LV	SO	09/25/96	CTC Dead 5+ Days EH
642	815	no	M	21	Minthorn- 1/2 mile above to 200m below		LV	SO	09/25/96	CTC Dead 3+ Days EH
450	637	no	M	26	Meacham Creek- mile 3.3		LV	Partial	09/19/96	
655	620	no	M	26	Meacham Creek- mile 3.3		LV	SO	09/19/96	
620	740	no	F	31	.4 miles below Camp Cr- Meacham		LV	s o	09/06/96	
6 6 0M31	810	no			Meacham-- cam to 3.5p miles downstream		LV	PM	09/19/96	NCP
595	720	no	F	37	North Fork Meacham	9600525	Ad	s o	09/30/96	CTC
610	730	no	F	101	McKay Creek-RM 4.2	96G0534	Ad	SO	09/19/96	No KD sample
670	870	no	M	101	McKay Creek-RM 1.4	96G0903	Ad	SO	09/19/96	No KD sample
690	790	no	F	101	McKay Creek-RM 3.6	9600533	Ad	R1200	09/19/96	No KD sample
620	1040	no	M	101	McKay Creek-RM4.0	96G0532	Ad	s o	09/19/96	No KD sample

Table G-6. Disposition of Umatilla River Spring Chinook Salmon above Three Mile Falls Dam, 1989-1996.

YEAR	1989	1990	1991	1992	1993	1994	1995	1996
Total Observed at TMD	164	2190	1330	464	1221	271	496	2273
Chinook Sacrificed/Mort. at TMD	36	26	234	200	16.5	31	56	57
Chinook Taken For Brood Stock	0	200	0	0	0	0	0	0
Number Released Above TMD	128	1965	1096	264	1056	234	440	2216
Number Released at TMD	--	--	--	--	9	6	16	
Number of Adipose Clipped Fish Released Above TMD	3	685	479	135	603	133	156	615
Estimated Harvest Above TMD	?	?	?	0	191	0	0	367
Number of Chinook Sampled on Spawning Grounds	6	272	264	79	474	113	217	740
Percent Recovered (all chinook)	4.7	13.8	24.1	29.9	44.9	47.1	49.3	40.7
Number of Ad. Clipped Chinook Recovered	0	83	136	39	356	50	78	166
Percent Recovered (ad. clipped)	0.0	12.1	28.4	28.9	59.0	37.6	50	27
Prespawning Mortalities Examined	0	0	88	22	125	20	72	262
Spawned Out Carcasses Examined	0	0	130	48	338	93	145	459
Redds Observed	14	287	144	59	224	74	90	347
Spawned Out Females Sampled	--		81	37	205	56	73	267

Table G-7. Umatilla River Spring Chinook Salmon Redd Distributions, 1989-1996.

YEAR	1989	1990	1991	1992	1993	1994	1995	1996
Total Redds Observed	14	287	144	59	224	74	90	347
RIVER SECTION	NUMBER OF REDDS OBSERVED / PERCENT BY REACH							
N. F. Umatilla River	o / o	68 123.5	13 / 9.0	10 / 16.9	27 / 12.1	16 121.6	13114.4	51/14.7
RM 86 to 89.5	14 / 100		21 114.6	13 122.0	25 / 11.2	13 / 17.6	21123.3	57116.4
RM 83 to 86		174 / 60.3	29 / 20.1	15 / 25.4	14 / 6.5	6 / 8.1	10/11.1	50/14.4
RM 80 to 83	0 / 0		26 / 18.1	13 122.0	31 / 13.8	9 / 12.2	13/14.4	44112.7
RM 78.9 to 80	o / o		20 / 13.9	6 / 10.2	39 / 17.4	14 / 18.9	13/14.4	3419.8
RM 76.7 to 78.9	o / o	36 / 12.5					7/7.8	29/8.4
RM 73.6 to 76.7	o / o		o / o	o / o	25 / 11.1	2 / 2.7	414.4	42112.1
RM 70.0 to 73.6	o / o	o / o	o / o	0 / 0	o / o	o / o	o/o	21/6.1
RM 67.5 to 70.0	o / o	o / o	o / o	o / o	o / o	o / o	o/o	8/2.3
RM 63.8 to 67.5	o / o	0 / 0	o / o	o / o	0 / 0	o / o	o/o	o/o
RM 59.5 to 63.8	0 / 0	o / o	o / o	o / o	o / o	0 / 0	o/o	o/o
Meacham RM 1-15	0 / 0	1113.7	35 124.3	1 / 1.7	63 / 28.1	14 / 18.9	9/10.0	1113.1

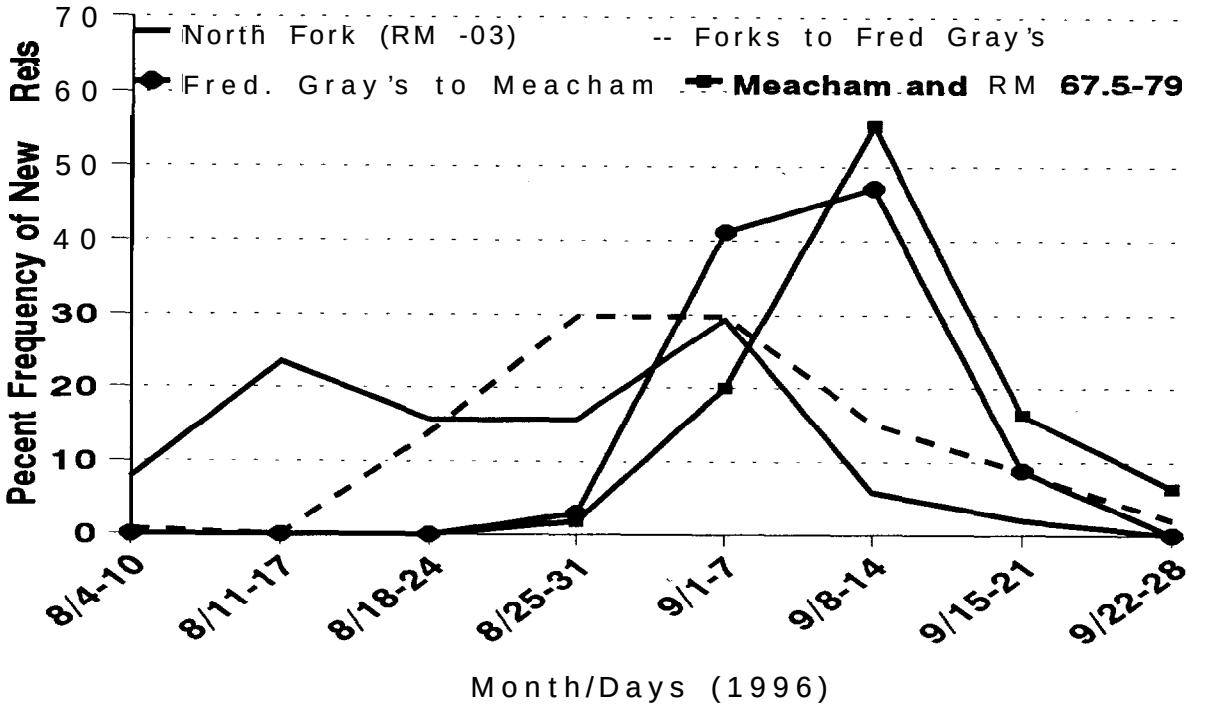


Figure 1. Spring Chinook Salmon Redd Timing by Reach, 1996; North Fork Umatilla River (RM O-3) n=51; Confluence of the North and South Fork to Fred Gray's Bridge (RM 89.5-80) n= 151; Fred Grey's Bridge to Mouth of Meacham Creek (RM 80-79) n=34, and Meacham Creek Confluence to Cayuse (RM 79-67.5) combined with Meacham Creek (RM O-9.6) n= 111.

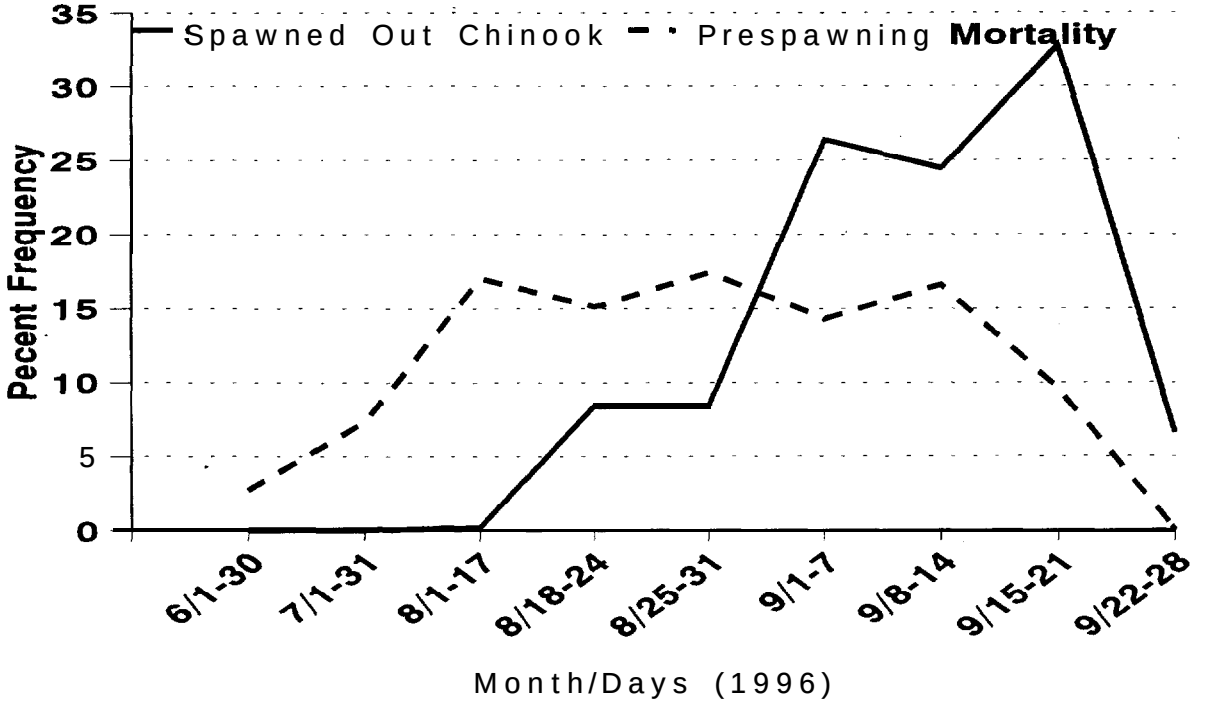


Figure 2. Timing of Dieoff of Spring Chinook Salmon in the Umatilla River, 1996

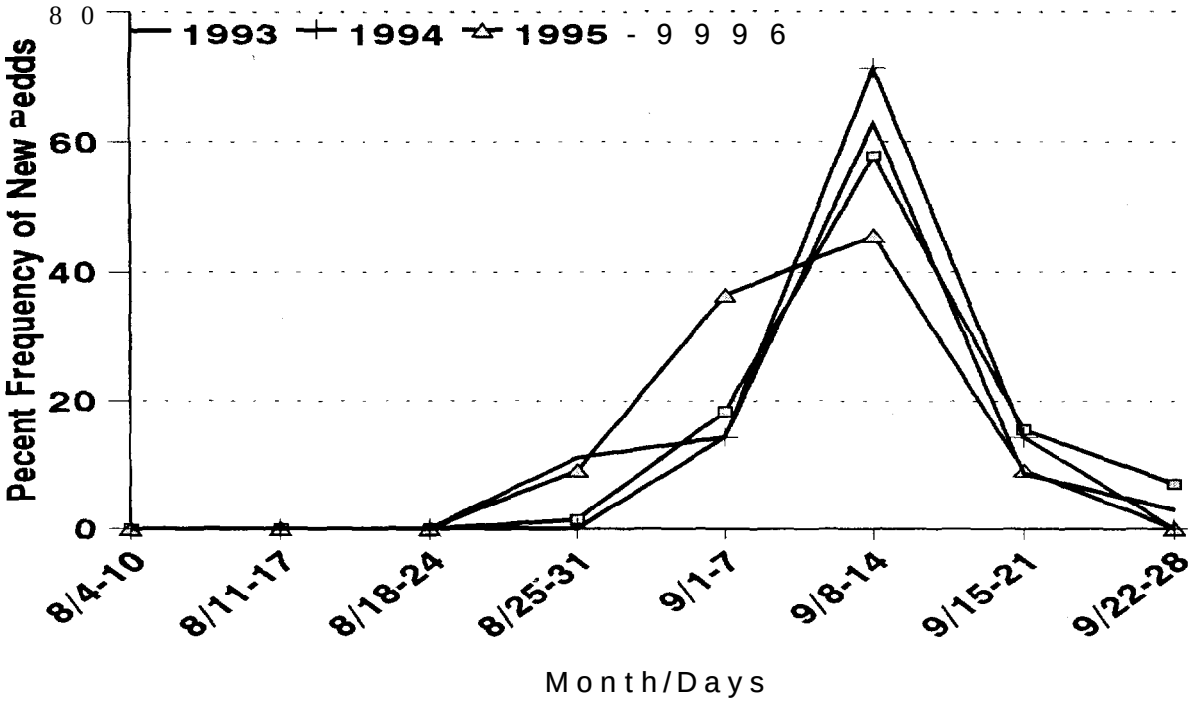


Figure 3. Spring Chinook Salmon Redd Timing, Umatilla River from the Meacham Creek Confluence to Thomhollow Bridge (RM 79.0-73.5) 1993-96.

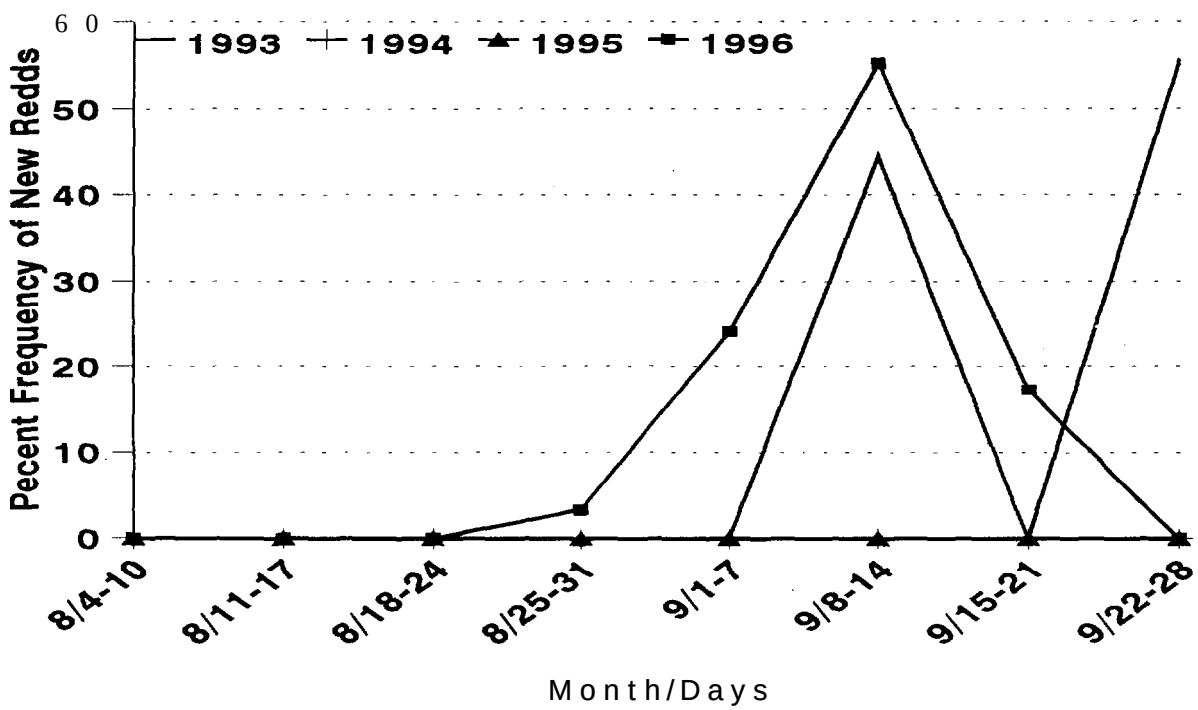


Figure 4. Spring Chinook Salmon Redd Timing, Umatilla River from Thornhollow Bridge to Mission Bridge (RM 73.5-79.0) 1993-96.

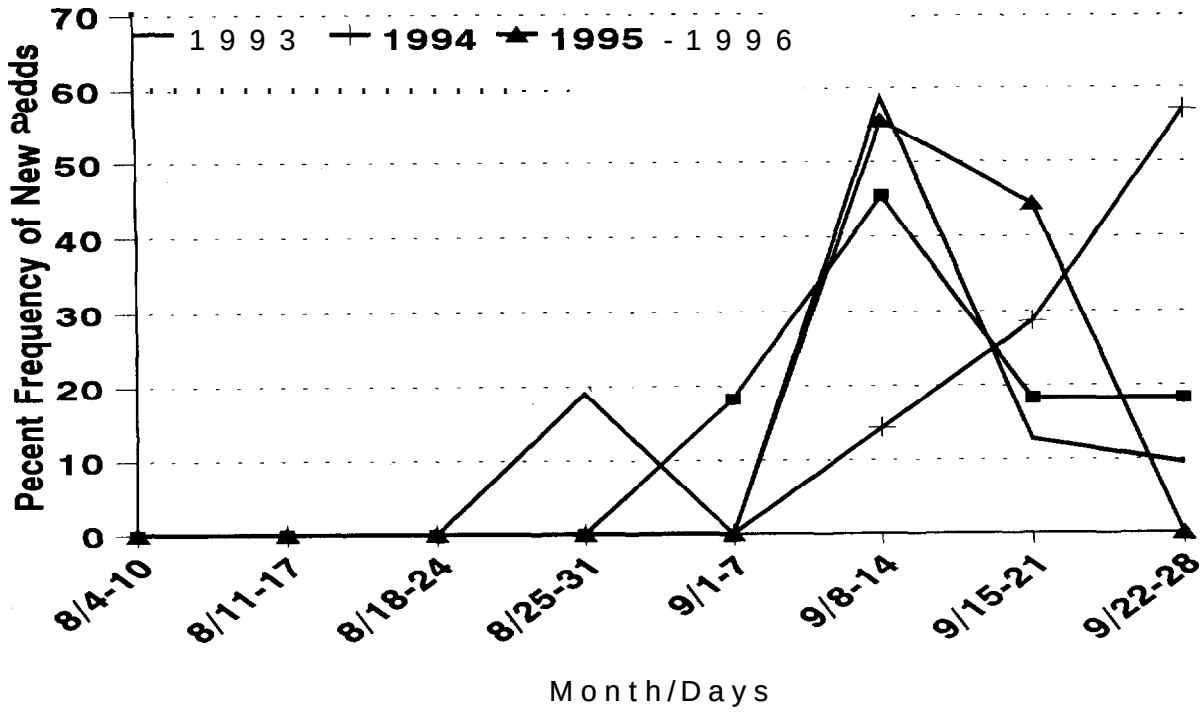


Figure 5. Spring Chinook Salmon Redd Timing, Meacham Creek (RM 0-15), 1993-96.

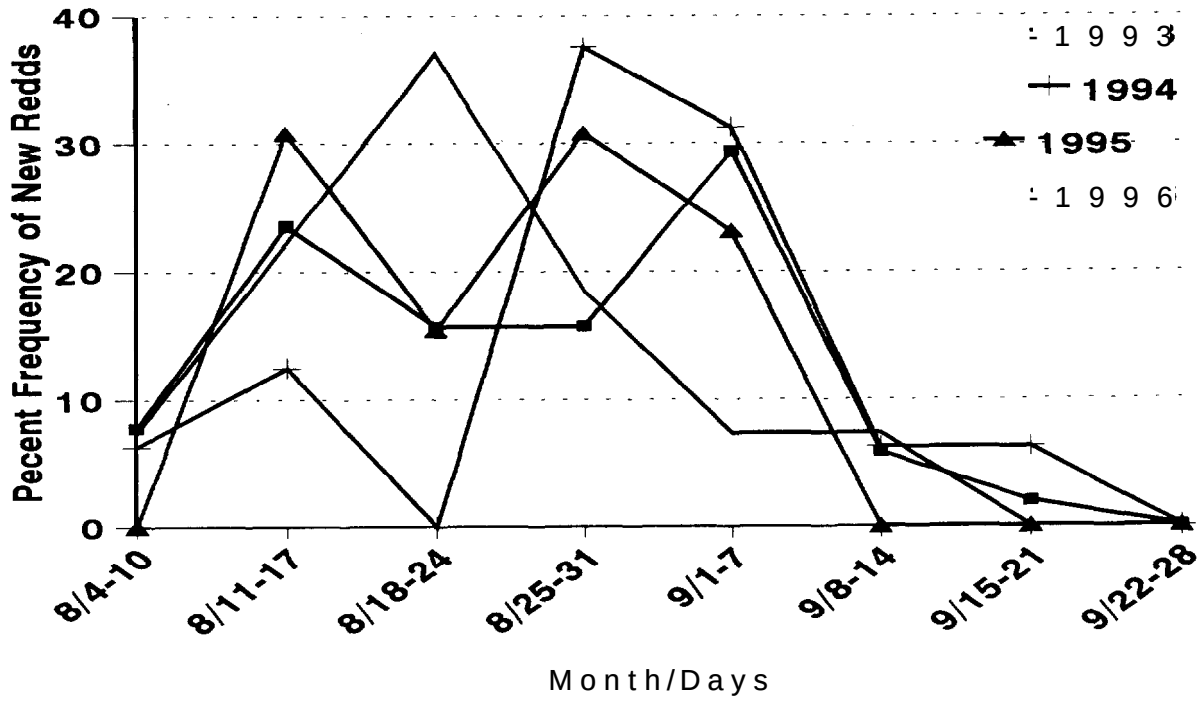


Figure 6. Spring Chinook Salmon Redd Timing, North Fork Umatilla River, 1993-96.

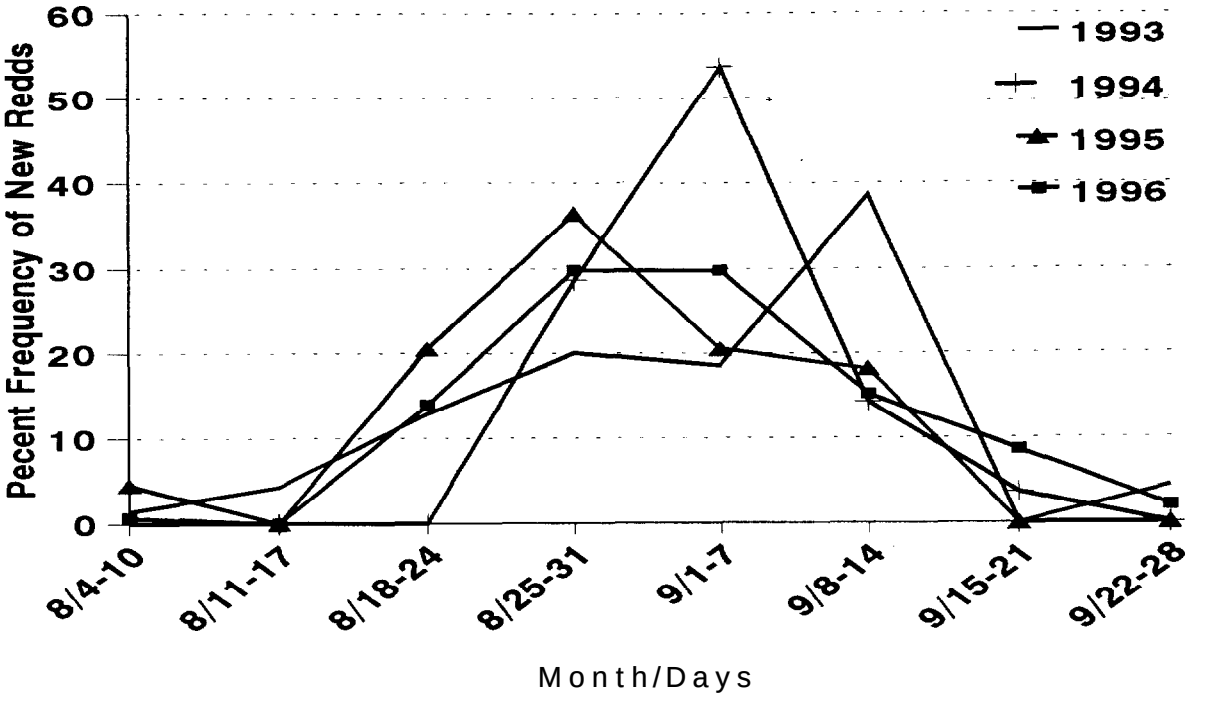


Figure 7. Spring Chinook Salmon Redd Timing, Umatilla River from the Confluence of the North and South Forks to Fred Gray's Bridge (RM 89.5 to 80.0), 1993-96.

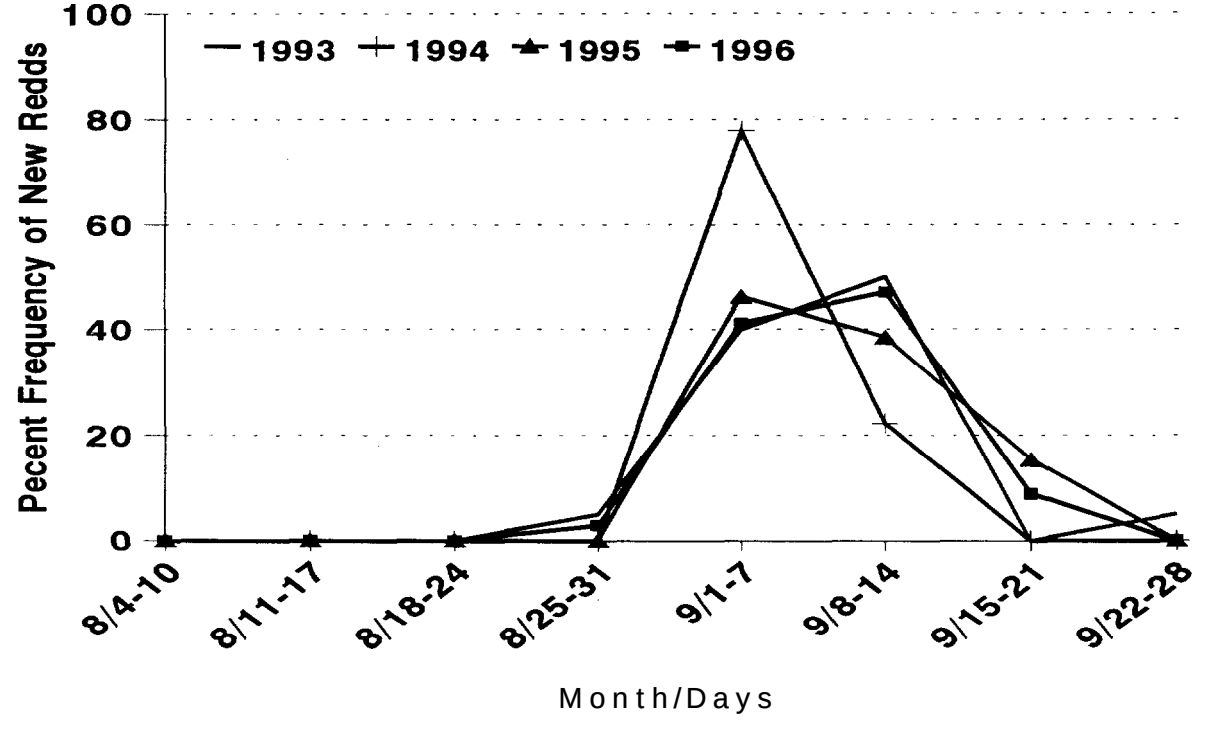


Figure 8. Spring Chinook Salmon Redd Timing, Umatilla River from Fred Gray's Bridge to the Confluence of Meacham Creek, (RM 80 to 79.0), 1993-96.

APPENDIX H
Adult Passage Examinations 1994-1995

Table H-l: Summer steelhead release dates, migrational timing. passage routes, and passage times (in days, hours and minutes) for Westland, Feed, and Stanfield Dams. Passage times between Three Mile Dam and Westland, Three Mile Dam and Stanfield, Westland and Feed, Feed and Stanfield, and Stanfield and ODFW (RM 56), Umatilla River 1995–96.

Westland–site 1

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Westland Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Westland to Feed days	Westland to Feed hrs/min	Total Hours
7/9	03/27/96	09:46	03/31/96	01:32	03/31/96	01:50	2	0	00:18	0.3	626	49	0	09:50	9.8
7/100	03/21/96	10:15	03/31/96	00:57	03/31/96	01:21	2	0	00:24	0.4	626	49	0	03:47	3.6
7/8	03/28/96	10:15	04/01/96	16:16	04/01/96	16:54	2	0	00:38	0.6	903	49	0	03:45	3.6
13/30	01/16/96	10:10	03/10/96	16:35	03/11/96	08:44	2	0	16:09	16.1	2105	47	0	01:28	1.4
7/4	03/07/96	10: 15	03/18/96	09:33	03/18/96	10:31	2	0	00:58	1.0	1360	46	0	02:12	2.2
7/95	01/22/96	10:37	03/09/96	15:33	03/09/96	16:43	1	0	01:10	1.2	1590	45	0	16:50	16.6
7/69	1 O/l 7/95	09:55	03/09/96	07:59	03/09/96	09:49	2	0	01:50	1.6	1590	45	0	02:18	2.3
13/15	01/03/96	10:30	02/23/96	10:08	02/23/96	12:41	2	0	02:33	2.6	1640	43	0	01:53	1.9
7/66	1 0/31/95	10: 15	02/26/96	15:58	02/29/96	14:49	2	2	22:51	70.9	1166	36	0	05:56	5.9
7/1	02/27/96	10:20	03/06/96	15:oo	03/06/96	16:09	2	0	01:09	1.1	1240	43	0	02:03	2.1
7/47	04/1 1/96	10: 16	04/13/96	01:26	04/13/96	02:59	1	0	01:33	1.5	937	51	0	01:41	1.7
7/15	03/1 9/96	09:48	04/03/96	06:38	04/03/96	07:17	1	0	00:39	0.7	1090	50	2	16:43	51.3
7/29	04/0 1/96	11: 12	04/04/96	21:49	04/05/96	10:54	2	0	13:05	13.1	640	51	0	02:24	2.4
7/93	03/05/96	11:00	03/20/96	18'14	03/23/96	18:02	2	2	23:48	71.6	637	50	7	19:21	167.3
7/46	04/09/96	10:30	"a	na	na	na	na	na	na	na	na	na	na	na	na
						Avg:		0.3		13.1			0.9		20.9

Feed Canal-site 2

Ch/Code	Rel Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Feed Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Feed to Stanfield Days	Feed to Stanfield hrs/min	Total Hours
7/9	03/27/96	09:46	03/31/96	11:40	04/01/96	14:56	2	1	03:16	27.3	657	46	0	17:10	17.2
7,100	03/21/96	10:15	03/31/96	05:08	04/01/96	23:34	2	1	18:26	42 4	a57	48	0	22:39	22.7
7/8	03/28/96	10:15	04/01/96	20:39	04/01/96	21:39	2	0	01:00	1.0	951	46	0	08:04	a.1
13/30	01/16/96	10:10	03/11/96	10:10	03/11196	10:47	2	0	00:37	0.6	2561	49	1	05:50	29.8
7/4	03/07/96	10:15	03/18/96	12:43	03/22/96	15:20	2	4	02:37	98.6	990	49	0	15:10	15.2
7/95	01/22/96	10:37	03/10/96	09:33	03/11/96	17:35	2	1	08:02	32.0	2506	47	1	23:52	47.9
7/69	10/17/95	09:55	03/09/96	12:07	03/10/96	06:52	2	0	16.45	18.8	2194	45	1	01:02	25.0
13/15	01/03/96	10:30	02/23/96	14:34	02/24/96	10:03	1	0	19:29	19.5	2010	43	0	23:37	23.6
7/66	10131/95	10:15	02/29/96	20:45	03/02/96	15:58	1	1	19:13	43.2	a34	36	0	22:04	22.1
7/1	02/27/96	10:20	03/06/96	18:12	03/09/96	14:53	1	2	20:41	68.7	1392	45	1	18:06	42.1
7/47	04/11/96	10:18	04/13/96	04:40	04/15/96	10:54	1	2	06: 14	54.2	1004	53	0	06:14	6.2
7/15	03/19/96	09:48	04/05/96	10:37	04/05/96	16:23	1	0	05:46	5.8	1302	52	0	14:28	14.5
7/29	04/01/96	11:12	04/05/96	13:18	04/05/96	14:16	1	0	00:58	1.0	1302	52	0	09:05	9.1
7/93	03/05/96	II:oo	03/31/96	13:23	04/06/96	01:04	1	5	11:41	131.7	1124	50	0	10:04	10.1
7/46	04/09/96	10:30	04/15/96	07:37	04/17/96	13:56	1	2	06:19	54.3	996	54	0	10:42	10.7
						Avg:		1.3		39.9			0.6		20.3

Stanfield–site 3

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Stanfield Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Stanfield to ODFW Days	Stanfield to ODFW Hrs/Min	Total Hours
7,s	03/27/96	09:46	04/02/96	08:06	04/02/96	09:30	1	0	01:24	1.4	1160	50	4	00:02	96.0
7/100	03/21/96	10:15	04/02/96	22:13	04/02/96	23:31	2	0	01:18	1.3	1160	50	5	07:42	127.7
7/8	03/28/96	10:15	04/02/96	05:43	04/02/96	06:38	2	0	00:55	0.9	1160	50	na	na	na
13/30	01/16/96	10:10	03/12/96	16:37	03/14/96	09:19	2	1	16:42	40.7	3590	48	5	01:35	121.6
714	03/07/96	10:15	03/23/96	06:30	03/23/96	12:41	1	0	06:11	6.2	935	50	a	00:57	192.9
7/95	01/22/96	10:37	03/13/96	17:27	03/14/96	14:41	2	0	21:14	21.2	3385	47	na	na	na
7/69	10/17/95	09:55	03/11/96	07:54	03/11/96	09:15	1	0	01:21	1.4	2750	49	5	14:42	134.7
13/15	01/03/96	10:30	02/25/96	09:40	02/25/96	10:31	2	0	00:51	0.8	1590	41	12	15:26	303.4
7/66	10/31/95	10:15	03/03/96	14:02	03/03/96	14:46	2	0	00:44	0.7	1230	46	6	01:44	145.7
7/1	02/27/96	10:20	03/11/96	08:59	03/11196	12:oo	1	0	03:01	3.0	2750	49	7	13:37	181.6
7/47	04/11/96	10:18	04/15/96	17:08	04/15/96	17:20	2	0	00:12	0.2	930	56	na	na	na
7/15	03/19/96	09:48	04/06/96	06:51	04/06/96	07:43	2	0	00:52	0.9	1300	54		20:03	44.1
7/29	04/01/96	11:12	04/05/96	23:21	04/06/96	06:33	2	0	07:12	7.2	1340	53	2	22:53	70.9
7/93	03/05/96	1 1:00	04/06/96	11:08	04/06/96	12:30	2	0	01:22	1.4	1300	54	2	22:54	70.9
7/46	04/09/96	10:30	04/1 8/96	00:38	04/18/96	01:22	1	0	00:44	0.7	1008	54	5	11:51	131.9
						Avg:		0.1		5.9			5.6		135.1

ODFW–site 4

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Days	3MD to Westland Hrs/Min	Total Hours	3MD to above Stfld Days	3MD to above Stfld Hrs/Min	Total Hours
7/9	03/27/96	09:46	04/06/96	OS.32	04/06/96	09:33	3	15:46	67.8	5	23:44	143.7
7/1 00	03/21/96	10:15	04/08/96	07:13	04/08/96	08:36	9	14:42	230.7	12	13:16	301.3
7/8	03/28/96	10:15	na	na	na	na	4	06:01	102.0	4	20:23	116.4
13/30	01/16/96	10:10	03/19/96	10:54	03/19/96	11:28	54	06:25	1302.4	57	23:09	1391.2
7/4	03/07/96	10: 15	03/31/96	13:38	03/31/96	14:50	10	23:18	263.3	16	02:26	366.4
7/95	01/22/96	10:37	na	na	na	na	47	04:56	1132.9	52	04:04	1252.1
7/69	10/17/95	09:55	03/16/96	23:57	03/17/96	00:30	143	22:04	3454.1	145	23:20	3503.3
13/15	01/03/96	10:30	03/09/96	01:57	03/09/96	02:53	50	23:38	1223.6	53	00:01	1272.0
7/66	10/31/95	10:15	03/09/96	16:30	03/09/96	17:11	116	05:43	2037.7	124	04:31	2960.5
7/1	02/27/96	10:20	03/1 9/96	01:37	03/19/96	06:31	a	04:40	196.7	13	01:40	313.7
7/47	04/11/96	10:18	"e	na	na	na		15:08	39.1	4	07:02	103.0
7/15	03/19/96	09:48	04/08/96	03:46	04/08/96	04:20	14	20:50	356.6	17	21:55	429.9
7/29	04/01/96	11'12	04/09/96	05:26	04/09/96	06 13	3	10:37	62.6	4	19:21	115.4
7/93	03/05/96	11:00	04/09/96	11:24	04/09/96	11:54	15	07:14	367.2	32	01:30	769.5
7/46	04/09/96	10:30	04/23/96	13:13	04/23/96	14:34	na	na	na	a	14:52	206.9
File name: 9596data						Avg:	34.6		634.1	36.9		665.7

Table H-2: Summer Steelhead release dates, migrational timing, passage routes, and passage times (in days, hours and minutes) for Westland, Feed, and Stanfield Dams. Passage times between Three Mile Dam end Westland, Three Mile Dam and Stanfield, Westland and Feed, Feed and Stanfield. and Stanfield end ODFW (RM 58), Umatilla River, 1994--95.

Westland--site 1

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Deys	Westland Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Westland to Feed days	Westland to Feed hrs/min	Total Hours
7/39	11/10/94	10:25	12/21/94	12:'lo	12/21/94	13:35	1	0	00:47	0.8	a73	46	5	14:01	134.0
7/40	11/17/94	10:05	12/21/94	15:42	12/21/94	16:35	1	0	00:53	0.9	673	46	5	06:27	126.5
7/45	11/30/94	10:30	02/04/95	10:55	02/04/95	12:55	2	0	02:00	2.0	2650	45	0	20:36	20.6
7/47	01/27/95	10:25	02/07/95	09:55	02/07/95	11:26	2	0	01:31	1.5	1760	45	0	02:56	2.9
7/42	01/13/95	10:25	02/18/95	03:58	02/18/95	11:56	2	0	07:58	0.0	1160	46	0	20:20	20.3
7/37	12/05/94	10:00	02/24/95	16:10	02/25/95	13:30	2	0	21:20	21 3	1640	49	1	01:08	25.1
7/46	01/18/95	10:10	02/23/95	07:15	02/23/95	19:08	2	0	11:53	1 1.9	2210	47	0	06:28	6.5
7/48	02/08/95	10:30	02/27/95	07:20	03/04/95	12:24	1	5	05:04	125.1	1263	44	4	23:04	110.1
7/3	03/23/95	10:10	03/30/95	15:17	03/30/95	18:16	1	0	02:59	3.0	857	45	0	15:38	15.6
7/85	03/14/95	10:20	03/27/95	15:04	03/27/95	18:31	2	0	03:27	3 5	1090	46	1	01:14	25.2
7/88	03/13/95	10:45	03/24/95	07:33	03/24/95	12:57	2	0	05:24	5.4	1550	43	0	01:49	1.8
7/81	03/06/95	10:45	03/28/95	18:45	03/29/95	01:03	1	0	06:18	6.3	950	47	0	19:49	19.6
7/5	03/27/95	10:30	04/06/95	06:54	04/06/95	08:00	2	0	01:06	1.1	888	50	0	03:30	3.5
7/82	03/06/95	10:45	04/04/95	07:08	04/04/95	08:59	1	0	01'51	1.9	707	51	0	01:19	1.3
7/22	04/07/95	10:25	04/13/95	14:35	04/13/95	15:23	2	0	00:48	0.8	1310	47	0	02:58	3.0
7/13	03/30/95	11:00	04/12/95	17:28	04/13/95	09:56	2	0	16:28	16.5	1240	47	0	08:01	8.0
						Avg:		0.5		13.1			1.4		33.3

/Feed Cannal--Site 2

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Feed Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Feed to Stanfield Days	Feed to Stanfield hrs/min	Total Hours
7/39	11/10/94	1025	12/27/94	03:36	12/27/94	11:20	1	0	07:44	7.7	1162	47	16	11:05	395.1
7/40	11/17/94	10:05	12/26/94	23:02	12/27/94	12:31	1	0	13:29	13.5	792	46	20	00.05	460.1
7/45	11/30/94	10:30	02/05/95	09:31	02/05/95	18:14	2	0	08:43	a.7	2449	47		05:42	29.7
7/47	01/27/95	10.25	02/07/95	14:22	02/26/95	09:08	1	18	18:46	450.6	1601	45		07:49	31.6
7/42	01/13/95	10:25	02/19/95	08:16	02/19/95	14:53	2	0	06:37	6.6	1676	49	2	01:36	49.6
7/37	12/05/94	10:00	02/26/95	14:38	03/10/95	13:04	1	11	22:26	266.4	774	46	0	22:21	22.3
7/46	01/18/95	10:10	02/24/95	01:36	03/09/95	15:57	1	13	14:21	326.3	691	46	2	00:24	46.4
7/48	02/08/95	10:30	03/09/95	11:28	03/09/95	12:04	1	0	00:36	0.6	552	50		01:54	25.9
7/3	03/23/95	10:10	03/31/95	09:54	04/02/95	18.10	1	2	08:16	56.3	563	50	0	18:01	18.0
7/85	03/14/95	10:20	03/28/95	19:45	04/01/95	13:03	1	3	17:18	89.3	621	46	0	06:48	6.8
7/88	03/13/95	10:45	03/24/95	14:46	03/25/95	14:04	2	0	23:18	233	1406	43	0	20:53	20.9
7/81	03/06/95	10:45	03/29/95	20.52	03/29/95	21'33	1	0	00:41	0.7	665	49	1	04:45	26.6
7/5	03/27/95	10:30	04/06/95	11:30	04/07/95	18:20	1	1	06.50	308	660	50	3	17:01	69.0
7/82	03/06/95	10:45	04/04/95	10:18	04/04/95	10:38	1	0	00:20	0 3	531	51	0	05:43	5.7
7/22	04/07/95	10:25	04/13/95	18:21	04/14/95	06:11	2	0	11:50	11.8	1315	47	0	13:42	13.7
7/13	03/30/95	11:00	04/13/95	17:57	04/14/95	15:32	1	0	21:35	21 6	1315	47	7	02:32	170.5
						Avg:		3.5		93.4			3.7		89.8

Stanfield-Site 3

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Stanfield Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Stanfield to ODFW Days	Stanfield to ODFW Hrs/Min	Total Hours
7/39	11/10/94	10:25	01/12/95	22:25	01/13/95	02:21	1	0	03:56	3.9	1075	42	14	17:18	353.3
7/40	11/17/94	10:05	01/16/95	12:36	01/16/95	13:45	1	0	01:09	1.2	2260	42	33	20:39	612.6
7/45	11/30/94	10:30	02/06/95	23:56	02/07/95	07:43	2	0	07:47	7.0	2145	44	17	04:48	412.6
7/47	01/27/95	10:25	02/27/95	16:57	02/27/95	17:48	1	0	00:51	0.8	1490	46	na	na	na
7/42	01/13/95	10:25	02/21/95	16:29	02/21/95	17:58	2	0	01:29	1.5	3420	47	na	na	na
7/37	12/05/94	10:00	03/11/95	11:25	03/11/95	12'16	2	0	00:53	0.9	851	50	na	na	na
7/46	01/18/95	10:10	03/11/95	16:21	03/11/95	16:57	2	0	00:36	0.6	651	50	na	na	na
7/48	02/08/95	10:30	03/10/95	13:58	03/10/95	15:39	2	0	01:41	1.7	731	46	na	na	na
7/3	03/23/95	10:10	04/03/95	12:11	04/03/95	12:34	1	0	00:23	0.4	662	55	na	na	na
7/85	03/14/95	10:20	04/01/95	19:51	04/01/95	20:30	2	0	00:39	0.7	727	53	5	01:04	121.1
7/88	03/13/95	10:45	03/26/95	10:57	03/26/95	12:11	2	0	01:14	1.2	1350	46	3	00:48	72.8
7/81	03/06/95	10:45	03/31/95	02:18	03/31/95	03:27	2	0	01:09	1.1	724	52	3	06:39	78.7
7/5	03/27/95	10:30	04/11/95	11:21	04/11/95	15:07	1	0	03:46	3.8	1460	52	na	na	na
7/82	03/06/95	10:45	04/04/95	16:21	04/04/95	16:50	2	0	00:29	0.5	734	54	5	04:06	124.1
7/22	04/07/95	10:25	04/14/95	19:53	04/15/95	17:11	2	0	21:18	21.3	1360	49	na	na	na
7/13	03/30/95	11:00	04/21/95	18:04	04/21/95	18:29	2	0	00:25	0.4	004	55	5	02:13	122.2
						Avg:		0.1		3.0			10.0		262.2

ODFW--site 4

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Days	3MD to Westland Hrs/Min	Total Hours	3MD to above Stfld Days	3MD to above Stfld Hrs/Min	Total Hours
7/39	11/10/94	10:25	01/27/95	19:39	01/27/95	19:56	41	02:23	966.4	63	15:56	1527.8
7/40	11/17/94	10:05	02/19/95	10:24	02/19/95	1025	34	05:37	621.6	60	03:40	1443.7
7/45	11/30/94	10:30	02/24/95	12:31	02/24/95	13'45	6 6	00:25	1.5644	68	21:13	1653.2
7/47	01/27/95	10:25	na	na	na	na	10	23:30	263.5	31	07:23	751.4
7/42	01/13/95	10:25	na	na	na	na	35	17:33	857.5	39	07:33	943.5
7/37	12/05/94	10:00	na	na	na	na	81	06:10	1950.2	96	02:18	2306.3
7/46	01/18/95	10:10	na	na	na	na	35	21:05	861.1	52	06:47	1254.6
7/48	02/08/95	10:30	na	na	na	na	18	20:50	452.9	30	05:09	725.2
7/3	03/23/95	10:10	na	na	na	na	7	05:07	173.1	11	02:24	266.4
7/85	03/14/95	10:20	04/06/95	21:34	04/06/95	22:08	13	04:44	316.7	18	10:10	442.2
7/88	03/13/95	10:45	03/29/95	12:59	03/29/95	13:17	10	20:48	260.6	13	01:26	313.4
7/81	03/06/95	10:45	04/03/95	10:06	04/03/95	10:50	22	08:00	536.0	24	16:42	592.7
7/5	03/27/95	10:30	na	na	na	na	9	20:24	236.4	15	04:37	364.6
7/82	03/06/95	10:45	04/09/95	20:56	04/09/95	21:30	26	20:23	692.4	29	06:05	702.1
7/22	04/07/95	10:25	na	na	na	na	6	04:10	146.2	8	06:46	198.6
7/13	03/30/95	11:00	04/26/95	20:42	04/26/95	21:14	13	06:28	3165	22	07:29	535.5
File name: 9495data;							27.2		653.7	36.5		076.4

Table H-3: Summer steelhead release dates, migrational timing, passage routes, and passage times (in days, hours and minutes) for Westland, Feed, and Stanfield Dams. Passage times between Three Mile Dam and Westland, Three Mile Dam and Stanfield, Westland and Feed, Feed and Stanfield, and Stanfield and ODFW (RM 56), Umatilla River, 1993-94.

Westland-site 1

Ch/Code	Rel. Dab	Rel. Time	First Date	First Time	Last Data	Last lima	Route	Westland Passage Days	Westland Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. lamps	Westland to Feed days	Westland to Feed hrs/min	Total Hours
7/1	10/19/93	1230	03/29/94	20:15	03/29/94	20.35	1	0	00:20	0.3	122	55	0	04:42	4.7
7/3	12/07/93	13:W	01/12/94	06:58	01/12/94	0609	1	0	01:11	12	667	46	0	09:44	97
7/4	12/13/93	10:30	01/08/94	21:55	01/08/94	22.45	2	0	00:50	0.8	807	42	0	15:29	15.5
7/5	01/07/94	11:30	01/12/94	17:18	01/12/94	17.51	2	0	00:33	0.5	667	46	0	03:17	33
7/6	01/10/94	11:50	03/10/94	12:02	03/10/94	12.03	2	0	w-01	0.0	955	47	0	03:21	3.3
7/7	01/12/94	11:15	02/27/94	20:29	02/28/94	10.55	1	0	14.26	14.4	249	44	0	03:09	32
7/10	04/25/94	10:00	04/26/94	20:33	04/26/94	20.49	1	0	00:16	0.3	331	57	0	01:38	1.6
7/13	03/11/94	12:W	03/13/94	23:25	03/13/94	23:39	2	0	00:14	0.2	754	49	0	02:57	30
7/14	03/11/94	12:00	03/17/94	21:34	03/17/94	22:19	2	0	00:45	0.8	1370	47	0	02:40	27
7/17	03/24/94	11.30	03/30/94	02:33	03/30/94	02:38	1	0	00:05	0.1	195	56	0	01:27	1.5
7/18	03/28/94	11:30	03/31/94	19:30	03/31/94	22:16	2	0	02:46	2.8	364	55	0	03:30	35
7/23	04/04/94	10.05	04/06/94	12:38	04/06/94	12:45	1	0	00.07	0.1	429	53	0	01:40	17
7/25	04/08/94	10.20	04/11/94	05:11	04/11/94	06:16	2	0	01.05	11	547	56	0	12:43	12.7
7/26	04/11/94	0949	04/14/94	20:13	04/14/94	20:20	2	0	00.07	0.1	478	52	0	13:56	139
7/27	04/14/94	10:10	04/16/94	06:51	04/16/94	06:56	1	0	00:05	0.1	416	57	0	0323	34
						Avg:		0.1		1 . 5			0.2		5.6

Feed Canal-site 2

Ch/Code	Rel. Data	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Feed Passage Days	Feed Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Feed to Stanfield Days	Feed to Stanfield hrs/min	Total Hours
7/1	10/19/93	12:30	03/30/94	01:17	04/01/94	1511	1	2	13:54	61.9	606	55	0	2338	236
7/3	12/07/93	13:Oo	01/12/94	17:53	01/13/94	1306	2	0	19:15	19.2	812	46	1	23:06	471
714	12/13/93	10:30	01/09/94	14:14	01/09/94	1812	1	0	03.58	4.0	450	44	0	14.05	14.1
715	01/07/94	11:30	01/12/94	21 08	01/12/94	21.37	1	0	00:29	0.5	624	46	0	13:25	134
7/6	01/10/94	11:50	03/10/94	15:24	03/10/94	16.36	2	0	01:12	12	656	47	1	00.51	24.8
7/7	01/12/94	11:15	02/28/94	14.04	03/03/94	12.40	2	2	22'36	706	2167	46	2	01:05	49.1
7/10	04/25/94	lo:w	04/26/94	22:27	04/27/94	02.30	2	0	04.03	41	579	58	0	13.31	13.5
7/13	03/11/94	12:w	03/14/94	02:36	03/14/94	22.50	1	0	20:14	202	629	49	0	1332	13.5
7/14	03/11/94	12:w	03/18/94	00:59	03/19/94	00 51	2	0	23:52	23.9	745	46	8	22.40	214.7
7/17	03/24/94	11:30	03/30/94	04:05	03/30/94	07:07	1	0	03:02	3.0	489	56	0	1143	117
7/18	03/28/94	11:30	04/01/94	01:46	04/20/94	18:05	2	19	16:19	472.3	721	55	0	06:12	6.2
7/23	04/04/94	10:05	04/06/94	1425	04/06/94	15:57	1	0	01:32	1.5	722	53	0	0809	8.2
7/25	04/08/94	10:20	04/11/94	18:59	04/12/94	16:09	1	0	21:10	21.2	756	56	na	na	na
7/26	04/11/94	09:49	04/15/94	10:16	04/16/94	14.55	2	1	0439	28.7	650	55	0	12.39	12.7
7/27	04/14/94	10:10	04/16/94	10:19	04/16/94	11'41	1	0	01.22	1.4	667	57	0	0926	94
						Avg:		2.0		48.9			1.4		33.0

Stanfield-site 3

Ch/Code	Rd. Data	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Stanfield Passage Days	Stanfield Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Tamps	Stanfield to ODFW Days	Stanfield to ODFW Hrs/Min	Total Hours
7/1	10/19/93	12:30	04/02/94	14:49	04/02/94	15:06	2	0	00:17	03	1033	55	14	00.19	336.3
7/3	12/07/93	13:w	01/15/94	12.14	01/15/94	1249	2	0	00:35	0.6	1380	45	10	08:57	249.0
7/4	12/13/93	10:30	01/10/94	08:17	01/10/94	1906	2	0	10.49	108	689	45	5	21:26	141.4
7/5	01/07/94	11:30	01/13/94	11:02	01/13/94	1153	2	0	w.51	08	1220	46	11	14:W	278.0
7/6	01/10/94	11:50	03/11/94	17:27	03/11/94	17:57	2	0	00:30	05	862	49	17	04.33	412.6
7/7	01/12/94	11:15	03/05/94	13:45	03/05/94	1428	2	0	00:43	0.7	2850	45	na	na	na
7110	04/25/94	lo:w	04/27/94	16:01	04/27/94	16.13	2	0	00:12	0.2	569	56	2	08:22	56.4
7/13	03/11/94	12:w	03/15/94	12:22	03/15/94	1259	2	0	00:37	0.6	994	51	10	15:33	255.6
7114	03/11/94	12:w	03/27/94	23:31	03/27/94	23.50	2	0	00.19	03	536	52	3	00:35	72.6
7117	03/24/94	11:30	03/30/94	18:50	03/30/94	19:06	2	0	00.16	0.3	727	56	2	07:47	55.8
7/18	03/28/94	11:30	04/21/94	00:17	04/21/94	00:33	2	0	W.16	03	1091	60	1	22:39	46.6
7/23	04/04/94	10:05	04/07/94	00:06	04/07/94	00:30	1	0	0024	0.4	916	52	2	05:55	539
7/25	04/08/94	10:20	na	na	na	na	na	na	na	na	na	na	na	na	na
7/26	04/11/94	09:49	04/17/94	03:34	04/17/94	03:58	1	0	00:24	0.4	893	60	15	18:02	378.0
7/27	04/14/94	10:10	04/16/94	21:07	04/17/94	00:22	2	0	03.15	33	836	58		19.36	436
						Avg:		0.1		1.4			7.:		183.1

ODFW-site 4

Ch/Code	Rd. Data	Rd. Time	First Data	First Time	Last Data	Last Time	3MD to Westland Days	3MD to Westland Hrs/Min	Total Hours	3MD to above Sffld Days	3MD to above Sffld Hrs/Min	Total Hours
7/1	10/19/93	12:30	04/16/94	15:25	04/16/94	1539	161	07:45	3871.8	165	02.36	3962.6
7/3	12/07/93	13:00	01/25/94	21:46	01/25/94	2208	35	17:58	858.0	38	23:49	9358
7/4	12/13/93	10:30	01/16/94	16.32	01/16/94	1711	26	1125	6354	28	08:36	680.6
7/5	01/07/94	11:30	01/25/94	01:53	01/25/94	02:06	5	0548	1258	6	00:23	144.4
7/6	01/10/94	1150	03/28/94	22:30	03/28/94	2240	59	00:12	14162	60	06:07	14461
7/7	01/12/94	11:15	na	na	na	na	46	09:14	1113.2	52	03:13	12512
7/10	04/25/94	10:00	04/30/94	00:35	04/30/94	00.41	46	1033	345	2	06:13	542
7/13	03/11/94	12.w	03/26/94	0432	03/26/94	04:43	2	11:25	594	4	00 59	97.0
7/14	03/11/94	12-w	03/31/94	00 25	03/31/94	00:38	6	09:34	1536	16	11 50	395.8
7117	03/24/94	1130	04/02/94	0253	04/02/94	0303	5	15.03	1350	6	07:36	151.6
7/18	03/28/94	11.30	04/22/94	2312	04/22/94	23.22	3	08:00	80 0	23	1303	565.0
7/23	04/04/94	10:05	04/09/94	06:25	04/09/94	06:35	2	02:33	50.5	2	14.25	62.4
7/25	04/08/94	lo:m	04/16/94	2248	04/16/94	22.58	2	18.51	668	na	na	na
7/26	04/11/94	09:49	05/02/94	22:w	05/02/94	22:01	3	10'24	82.4	5	18:09	138.2
7/27	04/14/94	10:10	04/18/94	1958	04/18/94	20.01	na	na	na	2	14-12	62.2
File name: 9394data						Avg:	25.8		620.2	29.6		710.5

Table H-4: Summer steelhead release dates, migrational timing, passage routes, and passage times (in days, hours and minutes) for **Westland** Dam, Umatilla River, 1993 through 1996.

Westland-site 1

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Westland Passage Days	Westland Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps
1995-96												
7/9	03/27/96	09:46	03/31/96	01:32	03/31/96	01:50	2	0	00:18	0.3	628	49
7/100	03/21/96	10:15	03/31/96	00:57	03/31/96	01:21	2	0	00:24	0.4	628	49
7/8	03/28/96	10:15	04/01/96	16:16	04/01/96	16:54	2	0	00:38	0.6	903	48
13/30	01/16/96	10:10	03/10/96	16:35	03/11/96	08:44	2	0	16:09	16.1	2105	47
7/4	03/07/96	10:15	03/18/96	09:33	03/18/96	10:31	2	0	00:58	1.0	1380	48
7/95	01/22/96	10:37	03/09/96	15:33	03/09/96	16:43	1	0	01:10	1.2	1590	45
7/69	10/17/95	09:55	03/09/96	07:59	03/09/96	09:49	2	0	01:50	1.8	1590	45
13/15	01/03/96	10:30	02/23/96	10:08	02/23/96	12:41	2	0	02:33	2.6	1840	43
7/66	10/31/95	10:15	02/26/96	15:58	02/29/96	14:49	2	2	22:51	70.9	1166	38
7/1	02/27/96	10:20	03/06/96	15:00	03/06/96	16:09	2	0	01:09	1.1	1240	43
7/47	04/11/96	10:18	04/13/96	01:26	04/13/96	02:59	1	0	01:33	1.5	937	51
7/15	03/19/96	09:48	04/03/96	06:38	04/03/96	07:17	1	0	00:39	0.7	1090	50
7/29	04/01/96	11:12	04/04/96	21:49	04/05/96	10:54	2	0	13:05	13.1	640	51
7/93	03/05/96	11:00	03/20/96	18:14	03/23/96	18:02	2	2	23:48	71.8	837	50
1994-95												
7/39	11/10/94	10:25	12/21/94	12:48	12/21/94	13:35	1	0	00:47	0.8	873	46
7/40	11/17/94	10:05	12/21/94	15:42	12/21/94	16:35	1	0	00:53	0.9	873	46
7/45	11/30/94	10:30	02/04/95	10:55	02/04/95	12:55	2	0	02:00	2.0	2650	45
7/47	01/27/95	10:25	02/07/95	09:55	02/07/95	11:26	2	0	01:31	1.5	1760	45
7/42	01/13/95	10:25	02/18/95	03:58	02/18/95	11:56	2	0	07:58	8.0	1160	46
7/37	12/05/94	10:00	02/24/95	16:10	02/25/95	13:30	2	0	21:20	21.3	1840	49
7/46	01/18/95	10:10	02/23/95	07:15	02/23/95	19:08	2	0	11:53	11.9	2210	47
7/48	02/08/95	10:30	02/27/95	07:20	03/04/95	12:24	1	5	05:04	125.1	1263	44
7/3	03/23/95	10:10	03/30/95	15:17	03/30/95	18:16	1	0	02:59	3.0	857	45
7/85	03/14/95	10:20	03/27/95	15:04	03/27/95	18:31	2	0	03:27	3.5	1090	46
7/88	03/13/95	10:45	03/24/95	07:33	03/24/95	12:57	2	0	05:24	5.4	1550	43
7/81	03/06/95	10:45	03/28/95	18:45	03/29/95	01:03	1	0	06:18	6.3	950	47
7/5	03/27/95	10:30	04/06/95	06:54	04/06/95	08:00	2	0	01:06	1.1	888	50
7/82	03/06/95	10:45	04/04/95	07:08	04/04/95	08:59	1	0	01:51	1.9	707	51
7/22	04/07/95	10:25	04/13/95	14:35	04/13/95	15:23	2	0	00:48	0.8	1310	47
7/13	03/30/95	11:00	04/12/95	17:28	04/13/95	09:56	2	0	16:28	16.5	1240	47
1993-94												
7/1	10/19/93	12:30	03/29/94	20:15	03/29/94	20:35	1	0	00:20	0.3	122	55
7/3	12/07/93	13:00	01/12/94	06:58	01/12/94	08:09	1	0	01:11	1.2	667	46
7/4	12/13/93	10:30	01/08/94	21:55	01/08/94	22:45	2	0	00:50	0.8	807	42
7/5	01/07/94	11:30	01/12/94	17:18	01/12/94	17:51	2	0	00:33	0.5	667	46
7/6	01/10/94	11:50	03/10/94	12:02	03/10/94	12:03	2	0	00:01	0.0	955	47
7/7	01/12/94	11:15	02/27/94	20:29	02/28/94	10:55	1	0	14:26	14.4	249	44
7/10	04/25/94	10:00	04/26/94	20:33	04/26/94	20:49	1	0	00:16	0.3	331	57
7/13	03/11/94	12:00	03/13/94	23:25	03113194	23:39	2	0	00:14	0.2	754	49
7/14	03/11/94	12:00	03/17/94	21:34	03/17/94	22:19	2	0	00:45	0.8	1370	47
7/17	03/24/94	11:30	03/30/94	02:33	03/30/94	02:38	1	0	00:05	0.1	195	56
7/18	03/28/94	11:30	03/31/94	19:30	03/31/94	22:16	2	0	02:46	2.8	364	55
7/23	04/04/94	10:05	04/06/94	12:38	04/06/94	12:45	1	0	00:07	0.1	429	53
7/25	04/08/94	10:20	04/11/94	05:11	04/11/94	06:16	2	0	01:05	1.1	547	56
7/26	04/11/94	09:49	04/14/94	20:13	04/14/94	20:20	2	0	00:07	0.1	478	52
7/27	04/14/94	10:10	04/16/94	06:51	04/16/94	06:56	1	0	00:05	0.1	416	57
						Average:		0.2 days		9.0 hours		

file name: 93296s1
Route: 2=jump, 1 =ladder

Table H-5: Summer steelhead release dates, migrational timing, passage routes, and passage times (in days, hours and minutes) for Feed Canal Dam, Umatilla River, 1993 through 1996.

Feed Canal - site2

Ch/Code	Rel. Date	Rel. Time	First Date	First lime	Last Date	Last Time	Feed Passage Route	Feed Passage Days	Feed Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps
1995-96												
7/9	03/27/96	09:46	03/31/96	11:40	04/01/96	1456	2	1	03:16	27.3	657	48
7/100	03/21/96	10:15	03/31/96	05:08	04/01/96	23:34	2	1	18:26	42.4	657	48
7/8	03/28/96	10:15	04/01/96	20:39	04/01/96	21:39	2	0	01:00	1.0	951	48
13/30	01/16/96	10:10	03/11/96	10:10	03/11/96	10:47	2	0	00:37	0.6	2561	49
7/4	03/07/96	10:15	03/18/96	12:43	03/22/96	15:20	2	4	02:37	98.6	990	49
7/95	01/22/96	10:37	03/10/96	09:33	03/11/96	17:35	2	1	08:02	32.0	2506	47
7/69	10/17/95	09:55	03/09/96	12:07	03/10/96	06:52	2	0	1a:45	18.8	2194	45
13/15	01/03/96	10:30	02/23/96	14:34	02/24/96	10:03	1	0	19:29	19.5	2010	43
7/66	10/31/95	10:15	02/29/96	20:45	03/02/96	15:58	1	1	19:13	43.2	a34	38
7/1	02/27/96	10:20	03/06/96	18:12	03/09/96	14:53	1	2	20:41	68.7	1392	45
7/47	04/11/96	10:18	04/13/96	04:40	04/15/96	10:54	1	2	06:14	54.2	1004	53
7/15	03/19/96	09:48	04/05/96	10:37	04/05/96	16:23	1	0	05:46	5.8	1302	52
7/29	04/01/96	11:12	04/05/96	13:18	04/05/96	14:16	1	0	00:58	1.0	1302	52
7/93	03/05/96	11:o0	03/31/96	13:23	04/06/96	01:04	1	5	11:41	131.7	1124	50
7/46	04/09/96	10:30	04/15/96	07:37	04/17/96	13:56	1	2	06:19	54.3	996	54
1994-95												
7/39	11/10/94	10:25	12/27/94	03:36	12/27/94	11:20	1	0	07:44	7.7	1162	47
7/40	11/17/94	10:05	12/26/94	23:02	12/27/94	12:31	1	0	13:29	13.5	782	46
7/45	11/30/94	10:30	02/05/95	09:31	02/05/95	18:14	2	0	08:43	8.7	2446	47
7/47	01/27/95	10:25	02/07/95	14:22	02/26/95	09:08	1	1a	18:46	450.8	1601	45
7/42	01/13/95	10:25	02/19/95	08:16	02/19/95	14:53	2	0	06:37	6.6	1878	49
7/37	12/05/94	10:00	02/26/95	14:38	03/10/95	13:04	1	11	22:26	286.4	774	46
7/46	01/18/95	10:10	02/24/95	01:36	03/09/95	15:57	1	13	14:21	326.3	891	46
7148	02/08/95	10:30	03/09/95	11:28	03/09/95	12:04	1	0	00:36	0.6	552	50
7/3	03/23/95	10:10	03/31/95	0954	04/02/95	18:10	1	2	08:16	56.3	563	50
7/85	03/14/95	10:20	03/28/95	19:45	04/01/95	13:03	1	3	17:18	89.3	621	48
7/88	03/13/95	10:45	03/24/95	14:46	03125195	14:04	2	0	23:18	23.3	1408	43
7/81	03/06/95	10:45	03/29/95	20:52	03/29/95	21:33	1	0	00:41	0.7	665	48
7/5	03/27/95	10:30	04/06/95	11:30	04/07/95	18:20	1	1	06:50	30.8	860	50
7/82	03/06/95	10:45	04/04/95	10:18	04/04/95	10:38	1	0	00:20	0.3	531	51
7/22	04/07/95	10:25	04/13/95	18:21	04/14/95	06:11	2	0	11:50	11.8	1315	47
7/13	03/30/95	11:00	04/13/95	17:57	04/14/95	15:32	1	0	21:35	21.6	1315	47
1993-94												
7/1	10/19/93	12:30	03/30/94	01:17	04/01/94	15:11	1	2	13:54	61.9	606	55
7/3	12/07/93	13:o0	01/12/94	17:53	01/13/94	13:08	2	0	19:15	19.2	812	46
7/4	12/13/93	10:30	01/09/94	14:14	01/09/94	18:12	1	0	03:58	4.0	450	44
7/5	01/07/94	11:30	01/12/94	21:08	01/12/94	21:37	1	0	00:29	0.5	624	46
7/6	01/10/94	11:50	03/10/94	15:24	03/10/94	16:36	2	0	01:12	1.2	656	47
7/7	01/12/94	11:15	02/28/94	14:04	03/03/94	12:40	2	2	22:36	70.6	2167	46
7/10	04/25/94	1o:00	04/26/94	22:27	04/27/94	02:30	2	0	04:03	4.1	579	58
7/13	03/11/94	12:o0	03/14/94	02:36	03/14/94	22:50	1	0	20:14	20.2	629	49
7/14	03/11/94	12:00	03/18/94	00:59	03/19/94	00:51	2	0	23:52	23.9	745	46
7/17	03/24/94	11:30	03/30/94	04:05	03/30/94	07:07	1	0	03:02	3.0	489	56
7/18	03/28/94	11:30	04/01/94	01:46	04/20/94	18:05	2	19	16:19	472.3	721	55
7/23	04/04/94	10:05	04/06/94	14:25	04/06/94	15:57	1	0	01:32	1.5	722	53
7/25	04/08/94	10:20	04/11/94	18:59	04/12/94	16:09	1	0	21:10	21.2	756	56
7/26	04/11/94	09:49	04/15/94	10:16	04/16/94	14:55	2	1	04:39	28.7	650	55
7/27	04/14/94	10:10	04/16/94	10:19	04/16/94	11:41	1	0	01:22	1.4	667	57

filename: 93296s2 Average: 2.36 days 56.8 hours

Route: 2=jump, 1=ladder

Table H-6: Summer steelhead release dates, migrational timing, passage routes, and passage times (in days, hours and minutes) for Stanfield Dam, Umatilla River, 1993 through 1996.

[Stanfield-site 3]

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Feed Passage Days	Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps
1995-96												
7/9	03/27/96	09:46	04/02/96	08:06	04/02/96	09:30	1	0	01:24	1.4	1180	50
7/100	03/21/96	10:15	04/02/96	22:13	04/02/96	23:31	2	0	01:18	1.3	1180	50
7/8	03/28/96	10:15	04/02/96	05:43	04/02/96	06:38	2	0	00:55	0.9	1180	50
13/30	01/16/96	10:10	03/12/96	16:37	03/14/96	09:19	2	1	16:42	40.7	3590	48
7/4	03/07/96	10: 15	03/23/96	06:30	03/23/96	12:41	1	0	06:11	6.2	935	50
7/95	01/22/96	10:37	03/13/96	17:27	03/14/96	14:41	2	0	21:14	21.2	3385	47
7/69	10/17/95	09:55	03/11/96	07:54	03/11/96	09:15	1	0	01:21	1.4	2750	49
13/15	01/03/96	10:30	02/25/96	09:40	02/25/96	10:31	2	0	00:51	0.8	1590	41
7/66	10/31/95	10:15	03/03/96	14:02	03/03/96	14:46	2	0	00:44	0.7	1230	46
7/1	02/27/96	10:20	03/11/96	08:59	03/11/96	12:00	1	0	03:01	3.0	2750	49
7/47	04/11/96	10:18	04/15/96	17:08	04/15/96	17:20	2	0	00:12	0.2	930	56
7/15	03/19/96	09:48	04/06/96	06:51	04/06/96	07:43	2	0	00:52	0.9	1300	54
7/29	04/01/96	11:12	04/05/96	23:21	04/06/96	06:33	2	0	07:12	7.2	1340	53
7/93	03/05/96	11:00	04/06/96	11:08	04/06/96	12:30	2	0	01:22	1.4	1300	54
7/46	04/09/96	10:30	04/18/96	00:38	04/18/96	01:22	1	0	00:44	0.7	1008	54
1994-95												
7/39	11/10/94	10:25	01/12/95	22:25	01/13/95	02:21	1	0	03:56	3.9	1075	42
7/40	11117194	10:05	01/16/95	12:36	01/16/95	13:45	1	0	01:09	1.2	2280	42
7/45	11/30/94	10:30	02/06/95	23:56	02/07/95	07:43	2	0	07:47	7.8	2145	44
7/47	01/27/95	10:25	02/27/95	16:57	02127195	17:48	1	0	00:51	0.8	1490	46
7/42	01/13/95	10:25	02/21/95	16:29	02/21/95	17:58	2	0	01:29	1.5	3420	47
7/37	12/05/94	lo:OO	03/11/95	11:25	03/11/95	12:18	2	0	00:53	0.9	851	50
7/46	01/18/95	10:10	03/11/95	16:21	03/11/95	16:57	2	0	00:36	0.6	851	50
7/48	02/08/95	10:30	03/10/95	13:58	03/10195	15:39	2	0	01:41	1.7	731	48
7/3	03/23/95	10:10	04/03/95	12:11	04/03/95	12:34	1	0	00:23	0.4	662	55
7/85	03/14/95	10:20	04/01/95	1951	04/01/95	20:30	2	0	00:39	0.7	727	53
7/88	03/13/95	10:45	03/26/95	10:57	03/26/95	12:11	2	0	01:14	1.2	1350	48
7/81	03/06/95	10:45	03/31/95	02:18	03/31/95	03:27	2	0	01:09	1.1	724	52
7/5	03/27/95	10:30	04/11/95	11:21	04/11/95	15:07	1	0	03:46	3.8	1460	52
7/82	03/06/95	10:45	04/04/95	16:21	04/04/95	16:50	2	0	00:29	0.5	734	54
7/22	04/07/95	10:25	04/14/95	19:53	04/15/95	17:11	2	0	21:18	21.3	1380	49
7/13	03/30/95	11:00	04/21/95	18:04	04/21/95	18:29	2	0	00:25	0.4	904	55
1993-94												
7/1	10/19/93	12:30	04/02/94	14:49	04/02/94	15:06	2	0	00:17	0.3	1033	55
7/3	12/07/93	13:00	01/15/94	12:14	01/15/94	12:49	2	0	00:35	0.6	1380	45
7/4	12/13/93	10:30	0111 0/94	08:17	01/10/94	19:06	2	0	10:49	10.8	689	45
7/5	01/07/94	11:30	01/13/94	11:02	01/13/94	11:53	2	0	00:51	0.8	1220	46
7/6	01/10/94	11:50	03/11/94	17:27	03/11/94	17:57	2	0	00:30	0.5	862	49
7/7	01/12/94	11:15	03/05/94	13:45	03/05/94	14:28	2	0	00:43	0.7	2850	45
7/10	04/25/94	lo:oo	04/27/94	16:01	04/27/94	16:13	2	0	00:12	0.2	569	58
7/13	03/1 1/94	12:00	03/15/94	12:22	03/15/94	12:59	2	0	00:37	0.6	994	51
7/14	03/1 1/94	12:00	03/27/94	23:31	03/27/94	23:50	2	0	00:19	0.3	536	52
7/17	03/24/94	11:30	03/30/94	18:50	03/30/94	19:06	2	0	00:16	0.3	727	56
7/18	03/28/94	11:30	04/21/94	00:17	04/21/94	00:33	2	0	00:16	0.3	1091	60
7/23	04/04/94	10:05	04/07/94	00:06	04/07/94	00:30	1	0	00:24	0.4	916	52
7/26	04/11/94	09:49	04/17/94	03:34	04/17/94	03:58	1	0	00:24	0.4	893	60
7/27	04/14/94	10:10	04/16/94	21:07	04/17/94	00:22	2	0	03:15	3.3	836	58

File name:93296s3

Average: 0.14 days **3.5 hours**

Route: 2=jump, 1=ladder

Table H-7: Spring Chinook Salmon release dates, **migrational timing, passage routes, and passage times** (in days, hours and minutes) for **Westland, Feed, and Stanfield** Dams. Passage times between Three Mile **Falls Dam** and **Westland**, Three Mile Falls Dam and Stanfield, **Westland** and Feed, Feed end Stanfield, and Stanfield and ODFW (RM **56**), **Umatilla** River, **1996.**

Westland–site 1

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Westland Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg: Temps	Feed days	Westland to Feed hrs/min	Total Hours
13/05	04/15/96	lo:oo	04/20/96	02:13	04/20/96	13:53	1	0	11:40	11.7	691	640	0	02:45	2.8
13/32	04/16/96	11:02	na	na	na	na	na	na	na	na	na	na	na	na	na
13/34	04/17/96	10:32	05/01/96	11:04	05/01/96	12:11	2	0	01:07	1.1	626	967	0	01:36	1.6
13/38	04/22/96	10:34	04/30/96	07:52	na	na	. na	na	na	na	na	na	na	na	na
13/43	04/30/96	10:30	05/07/96	15:01	05/07/96	16:12	2	0	01:11	1.2	127	296	0	01:42	1.7
13/61	04/30/96	10:55	05/03/96	02:27	05/03/96	03:53	1	0	01:26	1.4	440	619	0	01:21	1.3
13/58	04/30/96	10:55	05/04/96	01:59	05/04/96	04:19	2	0	02:20	2 3	272	453	0	10:04	10.1
13/68	05/02/96	10:20	05/07/96	17:01	05/08/96	05:34	2	0	12:33	12.6	120	292	0	06:54	6.9
13/71	05/02/96	10:03	05/16/96	17:35	05/16/96	18:14	1	0	00:39	0.7	743	927	0	00:54	0.9
13/98	05/06/96	10:15	05/11/96	01:26	05/11/96	03:05	1	0	01:39	1.6	18	178	0	01:10	1.2
7/83	05/07/96	10:30	05/12/96	00:54	05/12/96	01:40	1	0	00:46	0.8	27	168	0	01:00	1.0
7/81	05/07/96	10:45	05/10/96	11:12	05/10/96	11:27	2	0	00:15	0.3	70	250	0	02:10	2.2
7/86	05/15/96	11:02	05/16/96	03:38	05/16/96	07:59	2	0	04:21	4.3	743	927	0	01:50	1.8
13/74	05/02/96	10:20	05/07/96	19:23	05/08/96	05:40	2	0	10:17	10.3	292	56	0	06:48	6.6
						Avg:		0.1		3.4			0.1		3.2

Feed Canal–site 2

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Feed Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Feed to Stanfield Days	hrs/min	Total Hours
13/05	04/15/96	lo:oo	04/20/96	16:38	04/22/96	11:10	2	1	18:32	42.5	1012	51	0	07:51	7.9
13/32	04/16/96	11:02	04/21/96	01:51	04/23/96	12:13	2	2	10:22	56.4	1391	51	25	17:29	617.5
13/34	04/17/96	10:32	05/01/96	13:47	05/02/96	16:31	1	1	02:44	26.7	1202	53	24	13:04	599.1
13/38	04/22/96	10:34	04/30/96	12:28	05/02/96	03:21	1	1	14:53	36.9	1314	53	0	13:56	13.9
13/43	04/30/96	10:30	05/07/96	17:54	05/12/96	06:45	2	4	12:51	106.6	425	57	0	12.13	12.2
13/61	04/30/96	10:55	05/03/96	05:14	05/08/96	17:oa	2	5	11:54	131.9	655	55	0	05:02	5.0
13/58	04/30/96	10:55	05/04/96	14:23	05/06/96	15:10	2	2	00:47	46.6	665	54	0	08:30	a.5
13/68	05/02/96	10:20	05/08/96	12:28	05/08/96	20:35	1	0	08:07	6.1	534	56	0	19:25	19.4
13/71	05/02/96	10:03	05/16/96	19:08	05/16/96	19:52	1	0	00:44	0.7	1124	60	na	na	na
13/98	05/06/96	10:15	05/11/96	04:15	05/11/96	14:16	1	0	10:01	10.0	438	59	1	04:38	26.6
7/83	05/07/96	10:30	05/12/96	02:40	05/12/96	03:50	1	0	01:10	1.2	449	60	0	21:01	21.0
7/81	05/07/96	10:45	05/10/96	13:37	05/10/96	23:29	2	0	09:52	9.9	493	57	0	13:27	13.4
7/86	05/15/96	11:02	05/16/96	09:49	05/20/96	16:01	2	4	06:12	102.2	1472	57	0	07:08	7.1
13/74	05/02/96	10:20	05/08/96	12:28	05/09/96	14:16	2	1	01:48	25.6	469	56	0	14:31	14.5
						Avg:		1.6		43.0			0.2		3.6

Stanfield-site 3

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Stanfield Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg: Temps	Stanfield to ODFW Days	Hrs/Min	Total Hours
13/05	04/15/96	10:00	04/22/96	19:01	04/22/96	22:51	1	0	03:50	3.6	1279	51	13	02:01	314.0
13/32	04/16/96	11:02	05/19/96	05:42	05/19/96	10:57	1	0	05:15	5.3	1761	55	2	04:06	52.1
13/34	04/17/96	10:32	05/27/96	05:35	05/27/96	06:07	1	0	00:32	0.5	a44	62		09:37	33.6
13/38	04/22/96	10:34	05/02/96	17:17	05/02/96	18:21	2	0	01:04	1.1	1331	53	4	08:18	104.3
13/43	04/30/96	10:30	05/12/96	18:58	05/12/96	19:52	2	0	00:54	0.9	449	60	3	21:48	93.6
13/61	04/30/96	10:55	05/08/96	22:10	05/08/96	23:22	1	0	01:12	1.2	695	56	2	14'01	62.0
13/58	04/30/96	10:55	05/06/96	23:40	05/07/96	02:57	1	0	03:17	3.3	726	56	3	11:56	63.9
13/68	05/02/96	10:20	05/09/96	16:00	05/09/96	16:27	1	0	00:27	0.4	549	56	4	19:06	115.1
13/71	05/02/96	10:03	na	na	na	na	na	na	na	na	na	na	na	na	na
13,Qa	05/06/96	10:15	05/12/96	18:54	05/12/96	19:18	2	0	00'24	0.4	449	60	2	19:40	67.7
7/83	05/07/96	10:30	05/13/96	00:51	05/13/96	01:38	1	0	00:47	0.6	587	62	2	16:18	64.3
7/81	05/07/96	10:45	05/11/96	12:56	05/11/96	14:15	2	0	01:19	1.3	438	59	2	06:35	54.6
7/86	05/15/96	11:02	05/20/96	23:00	05/21/96	05:05	1	0	05:56	5.9	1891	56	4	00:22	96.4
13/74	05/02/96	10:20	05/10/96	04:47	05/16/96	15:oo	1	6	10:22	154.4	987	60	4	20:47	116.6
						Avg:		0.5		12.6			4.0		06.6

ODFW–site 4

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Days	3MD to Westland Hrs/Min	Total Hours	3MD to above Stfld Days	Hrs/Min	Total Hours
13/05	04/15/96	10:00	05/06/96	00:52	05/06/96	01:19	4	16:13	112.2	7	12:51	160.6
13/32	04/16/96	11:02	05/21/96	15:03	05/27/96	06:29	na	na	na	32	23:55	791.9
13/34	04/17/96	10:32	05/28/96	15:44	05/30/96	03:07	14	00:32	336.5	39	19:35	955.6
13/38	04/22/96	10:34	05/07/96	02:39	05/07/96	03:16	7	21:18	189.3	10	07:47	2476
13/43	04/30/96	10:30	05/16/96	17:40	05/16/96	18:27	7	04:31	172.5	12	09:22	297.4
13/61	04/30/96	10:55	05/11/96	13:23	05/11/96	14:oa	2	15:32	63.53	8	12:27	204.5
13/58	04/30/96	10:55	05/10/96	14:53	05/10/96	20:18	3	15:04	67.07	6	16:02	160.0
13/68	05/02/96	10:20	05/14/96	11:33	05/14/96	12:05	5	06:41	126.7	7	06:07	174.1
13/71	05/02/96	10:03	05/20/96	13:19	05/20/96	13:49	14	07:32	343.5	na	na	
13,0a	05/06/96	10:15	05/15/96	14:58	05/15/96	15:47	4	15:11	111.2	6	09:03	1531:
7/83	05/07/96	10:30	05/15/96	17:56	05/15/96	18:19	4	14:24	110.4	5	15:08	135.1
7/81	05/07/96	10:45	05/13/96	20:50	05/13/96	20:58	3	00:27	72.45	4	03:30	so.5
7/86	05/15/96	11:02	05/25/96	05:27	05/25/96	na	0	16:36	16.6	5	18:03	138.1
13/74	05/02/96	10:20	05/21/96	11:56	05/30/96	04:46	5	09:03	129	14	04:49	340.6
File name: data9596						Avg.	6.0		143.9	12.4		206.4

Table H-6: Spring **Chinook Salmon release dates, migrational timing, passage routes. and passage times (in days, hours and minutes) for Westland. Feed, and Stanfield Dams. Passage times between Three Mile Fails Dam and Westland, Three Mile Falls Dam and Stanfield, Westland and Feed, Feed and Stanfield, and Stanfield and ODFW (RM 56) , Umatiiia River. 1994, 1995.**

Westland-site 1

Ch/Code	Rel. Date	Rei. Time	First Date	First Time	Last Date	Last Time	Route	Days	Westland Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg: Temps	Westiand to Feed days	Westiand to Feed hrs/min	Total Hours
13/14	04/14/94	10:10	04/19/94	06:34	04/19/94	07:05	1	0	00:31	0.5	630	61	0	01:28	1.5
13/15	04/25/94	10:00	04/30/94	04:21	04/30/94	21:18	1	0	16:57	17.0	161	59	1	01:11	25.2
13/16	04/26/94	10:15	05/07/94	13:44	05/07/94	20:28	2	0	06:44	6.7	120	67	0	02:52	2.9
13/17	04/27/94	10:30	05/05/94	05:54	05/05/94	18:39	2	0	12:45	12.6	146	63	0	02:13	2.2
13/18	04/29/94	10:00	05/08/94	02:08	05/22/94	12:17	1	14	10:09	346.1	73	66	0	02:39	2.7
13/32	04/10/95	10:00	04/19/95	18:18	04/19/95	19:40	1	0	01:22	1.4	911	48	0	18:20	18.3
13/34	04/11/95	10:20	04/19/95	20:57	04/19/95	22:14	2	0	01'17	1.3	911	48	0	14:42	14.7
13/36	04/13/95	10:30	04/23/95	09:57	04/23/95	11:33	1	0	01:36	1.6	797	54	0	21:49	21.0
13/37	04/14/95	09:55	04/22/95	19:12	04/23/95	20:45	2	1	01:33	25.5	796	53	na	na	na
13/38	04/18/95	10:13	04/23/95	03:18	04/23/95	12:23	2	0	09:05	9.1	797	54	0	06:59	7.0
13/40	04/20/95	10:20	04/23/95	04:30	04/23/95	06.21	2	0	01:51	1.9	797	54	0	04:34	4.6
13/41	04/19/95	10:15	04/23/95	06:56	04/23/95	08:30	1	0	01:34	1.6	797	54	1	03:51	27.8
13/31	04/24/95	10:40	04/26/95	08:05	04/26/95	09:22	2	0	01:17	1.3	805	55	0	03:55	3.9
13/35	04/13/95	10:30	04/26/95	13:45	04/26/95	14:35	2	0	00:50	0.6	605	55	0	13:25	13.4
13/43	04/24/95	10:40	04/26/95	18:39	04/26/95	19:12	1	0	00:33	0.6	805	55	0	09:58	10.0
13/42	04/26/95	10'10	na	na	na	na	na	na	na	na	na	na	na	na	na
						Avg:		1.2		26.5			0.5		11.1

/Feed Canal-site 2

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Feed Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg. Temps	Feed to Stanfield Days	Feed to Stanfield hrs/min	Total Hours
13/14	04/14/94	10:10	04/19/94	08:33	04/19/94	14.46	2	0	06:15	6.3	1063	61	0	19:02	19.0
13/15	04/25/94	lo:oo	05/01/94	22:29	05/03/94	00:22	2	1	01:53	25.9	374	59		00:02	24.0
13/16	04/26/94	10:15	05/07/94	23:20	05/08/94	05:53	1	0	06:33	6.6	352	66	na	na	na
13/17	04/27/94	10:30	05/05/94	20:52	05/05/94	21:29	2	0	00:37	0.6	365	63	0	06:20	6.3
13/18	04/29/94	lo:oo	05/22/94	14:56	05/23/94	11:31	2	0	20:35	20.6	1332	62	0	05:03	5.0
13/32	04/10/95	10:00	04/20/95	14:00	04/24/95	04:30	2	3	14:30	86.5	739	51	0	11:49	11.6
13134	04/11/95	10:20	04/20/95	12:56	04/25/95	05:14	1	4	16:18	112.3	721	52	0	08:17	a.3
13/36	04/13/95	10:30	04/24/95	09:22	04/24/95	22:29	1	0	13:07	13.1	669	52	0	13:58	14.0
13/37	04/14/95	09:55	na	na	na	na	na	na	na	na	na	na	na	na	na
13/38	04/18/95	10:13	04/23/95	19:22	04/24/95	15:16	1	0	19:54	19.9	705	53	0	09:19	9.3
13/40	04/20/95	10:20	04/23/95	10.55	04/23/95	13'14	1	0	02:19	2.3	720	54	0	07:22	7.4
13141	04/19/95	10:15	04/24/95	12:21	04/26/95	13:41	1	2	01:20	49.3	700	54	na	na	na
13/31	04/24/95	10:40	04/26/95	13:17	04/26/95	17:Oa	2	0	03:51	3.9	737	55	2	03:41	51.7
13/35	04/13/95	10:30	04/27/95	04:00	04/27/95	04:48	1	0	00:48	0.6	796	55	4	13:03	109.0
13/43	04/24/95	10:40	04/27/95	05:10	05/22/95	02:38	2	24	21:28	597.5	2772	55	0	08:15	6.3
13/42	04/26/95	10:10	05/18/95	14:02	05/19/95	01:05	2	0	11:03	11.1	1060	55	0	13:00	13.0
						Avg:		2.7		63.6			0.0		22.1

Stanfield-site 3

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Route	Days	Stanfield Passage Hrs/Min	Total Hours	Avg. Flows (cfs)	Avg: Tsmps	Stanfield to ODFW Days	Stanfield to ODFW Hrs/Min	Total Hours
13/14	04/14/94	10:10	04/20/94	09:50	04/20/94	10:20	2	0	00:30	0.5	1077	60	3	21:14	93.2
13/15	04/25/94	10:00	05/04/94	00:24	05/04/94	01:16	2	0	00:52	0.9	344	a2	na	na	na
13/16	04/26/94	10:15	na	na	na	na	na	na	na	na	na	na	na	na	na
13/17	04/27/94	10:30	05/06/94	03:49	05/06/94	04:41	1	0	00:52	0.9	372	65	2	17:22	65.4
13/18	04/29/94	10:00	05/23/94	16:34	05/23/94	17.39	2	0	01:05	1.1	1221	a3		23:27	47.4
13/32	04/10/95	lo:w	04/24/95	16:19	04/24/95	16:40	2	0	00:21	0.3	689	52.32	13	11:31	323.5
13/34	04/11/95	10:20	04/25/95	13:31	04/25/95	14:00	1	0	00:29	0.5	675	56.57	a	04:21	196.4
13/36	04/13/95	10:30	04/25/95	12:27	04/25/95	13:04	2	0	00:37	0.6	675	56.57	20	13:40	493.7
13/37	04/14/95	09:55	na	na	na	na	na	na	na	na	na	na	na	na	na
13/38	04/18/95	10:13	04/25/95	00:35	04/25/95	01:39	2	0	01:04	1.1	675	56.57	13	14:35	326.6
13/40	04/20/95	10:20	04/23/95	20:36	04/24/95	08:57	2	0	12:21	12.3	705	53.3	2	19:10	67.2
13/41	04/19/95	10:15	04/27/95	07:32	04/27/95	08:30	2	0	00:58	1.0	796	63	na	na	na
13/31	04/24/95	10:40	04/28/95	20:49	04/28/95	23.39	2	0	02:50	2.6	1456	52.76	19	18:55	474.9
13/35	04/13/95	10:30	05/01/95	17:51	05/02/95	11:35	2	0	17:44	17.7	3761	47.95	16	14:48	396.6
13/43	04/24/95	10:40	05/22/95	10:53	05/22/95	11:14	2	0	00:21	0.4	657	60.5	2	02:25	50.4
13/42	04/26/95	10:10	05/19/95	14:05	05/19/95	14:36	2	0	00:31	0.5	1008	57	4	12:15	106.2
						Avg:		0.1		2.0			9.2		220.5

ODFW-site 4

Ch/Code	Rel. Date	Rel. Time	First Date	First Time	Last Date	Last Time	Days	3MD to Westland Hrs/Min	Total Hours	3MD to above Sffld Days	3MD to above Sffld Hrs/Min	Total Hours
13/14	04/14/94	10:10	04/24/94	07:34	04/24/94	07:48	4	20:24	116.4	6	00:10	144.2
13/15	04/25/94	10:00	na	na	na	na	4	18:21	114.3	a	15:16	207.3
13/16	04/26/94	10:15	05/13/94	00:09	05/13/94	00:30	11	03:29	267.5	na	na	na
13/17	04/27/94	10:30	05/08/94	22:03	05/08/94	22:09	7	19:24	167.4	6	18:11	210.2
13/18	04/29/94	10:00	05/25/94	17:06	05/25/94	17.13	a	16:08	206.1	24	07:39	563.6
13/32	04/10/95	10:00	05/08/95	04:11	05/08/95	04:19	9	08:18	224.3	14	06:40	342.7
13/34	04/11/95	10:20	05/03/95	18:21	05/03/95	19:04	6	10:37	202.6	14	03:40	339.7
13/36	04/13/95	10:30	05/16/95	02:44	05/16/95	03:08	9	23:27	239.4	12	02:34	290.6
13/37	04/14/95	09:55	na	na	na	na	a	09:17	201.3	na	na	na
13/38	04/18/95	10:13	05/08/95	16:14	05/08/95	16:56	4	17:05	113.1	6	15:26	159.4
13/40	04/20/95	10:20	04/27/95	04:07	04/27/95	11:50	2	18:10	66.2	3	22:37	94.6
13/41	04/19/95	10:15	na	na	na	na	3	20:41	92.7	na	na	na
13/31	04/24/95	10:40	05/18/95	18:34	05/18/95	18:50		21:25	45.4	4	12:59	109.0
13/35	04/13/95	10:30	05/19/95	02:23	05/19/95	02:45	13	03:15	315.3	19	01:05	457.1
13/43	04/24/95	10:40	05/24/95	13:39	05/24/95	13:50	2	07:59	56.0	26	00:34	672.6
13/42	04/26/95	10:10	05/24/95	02:51	05/24/95	03:16	na	na	na	23	04:26	556.4
File name: data9495						Avg.	6.6		-163.3	13.4		320.6

Table H-9: Summer steelhead passage times (days, hours, minutes) and miles moved per day between the release sit Nolin) and ODFW (RM 56), Upstream Transport Evaluation, Umatilla River, 1993-96.

1993–94

Ch/Code	Rel. Site	Release Date	Release Time	ODFW First Date	ODFW First Time	Days	Rel. Site to ODFW Hrs/Min	Total Hours	Miles/Day
7/8	Barnhart	02/28/94	11:00	03/06/94	06:14	5	19:14	139.2	2.4
7/10	Nolin	03/09/94	11:00	03/13/94	03:29	3	16:29	88.48	6.1
7/12	Barnhart	03/10/94	11:10	03/13/94	20:47	3	09:37	81.62	4.1
7/15	Nolin	03/14/94	11:00	03/24/94	02:41	9	15:41	231.7	2.3
7/16	Barnhart	03/22/94	10:40	03/24/94	13:36	2	02:56	50.93	6.5
7/21	Nolin	03/31/94	10:50	04/02/94	18:58	2	08:08	56.13	9.6
							Avg:	108	5.2

1994–95

Ch/Code	Rel. Site	Release Date	Release Time	ODFW First Date	ODFW First Time	Days	Rel. Site to ODFW Hrs/Min	Total Hours	Miles/Day
7/49	Nolin	02/27/95	11:00	03/27/95	19:53	28	08:53	680.9	0.5
7/6	Nolin	03/27/95	11:30	03131195	20:11	4	08:41	104.7	3.2
7/20	Barnhart	04/07/95	10:45	04/11/95	20:55	4	10:10	106.2	3.1
7/38	Barnhart	11/10/94	10:30	01/29/95	23:21	80	12:51	1933	0.2
							Avg:	706.1	1.7

1995–96

Ch/Code	Rel. Site	Release Date	Release Time	ODFW First Date	ODFW First Time	Days	Rel. Site to ODFW Hrs/Min	Total Hours	Miles/Day
7/12	Barnhart	03/18/96	10:33	03/21/96	01:10	2	14:37	62.62	5.3
7/97	Barnhart	03/21/96	11:00	03/30/96	18:07	9	07:07	223.1	1.5
7/34	Barnhart	03/29/96	11:00	04/06/96	03:26	7	16:26	184.4	1.8
7/41	Barnhart	04/10/96	11:30	04/15/96	13:50	5	02:20	122.3	2.7
7/45	Barnhart	04/10/96	11:30	04/20/96	12:17	10	00:47	240.8	1.4
7/44	Barnhart	04/11/96	11:30	04/23/96	09:32	11	22:02	286	1.2
file name: 9395#1							Avg:	186.6	2.3

Table H-10: Summer steelhead passage times (days, hours, minutes) and miles moved per day between Stanfield D and ODFW (RM 56), Passage Evaluation, Umatilla River, 1993-96.

1993–94

Ch/Code	Rel. Date	Stanfield Last Date	Stanfield Last Time	ODFW First Date	ODFW First Time	Days	Stan. to ODFW Passage Hrs/Min	Total Hours	Miles/Day
7/1	10/19/94	04/02/94	15:06	04/16/94	15:25	14	00:19	336.3	1.7
7/3	12/07/94	01/15/94	12:49	01/25/94	21:46	10	08:57	249	2.3
7/4	12/13/94	01/10/94	19:06	01/16/94	16:32	5	21:26	141.4	4.0
7/5	01/07/94	01/13/94	11:53	01/25/94	01:53	11	14:oo	278	2.0
7/6	01/10/94	03/11/94	17:57	03/28/94	22:30	17	04:33	412.6	1.4
7/10	04/25/94	04/27/94	02:30	04/30/94	00:35	2	22:05	70.08	8.1
7/13	03/11/94	03/15/94	12:59	03/26/94	04:32	10	15:33	255.6	2.2
7/14	03/11/94	03/27/94	23:50	03/31/94	00:25	3	00:35	72.58	7.8
7/17	03/24/94	03/30/94	19:06	04/02/94	02:53	2	07:47	55.78	10.2
7/18	03/28/94	04/21/94	00:33	04/22/94	23:12	1	22:39	46.65	12.1
7/23	04/04/94	04/07/94	00:30	04/09/94	06:25	2	05:55	53.92	10.5
7/26	04/11/94	04/17/94	03:58	05/02/94	22:oo	15	18:02	378	1.5
7/27	04/14/94	04/17/94	00:22	04/18/94	19:58	1	19:36	43.6	13.0
							Avg:	184.1	5.9

1994–95

Ch/Code	Rel. Date	Stanfield Last Date	Stanfield Last Time	ODFW First Date	ODFW First Time	Days	Stan. to ODFW Passage Hrs/Min	Total Hours	Miles/Day
7/39	11/10/94	01/13/95	02:21	01/27/95	19:39	14	17:18	353.3	1.6
7/40	11/17/94	01/16/95	13:45	02/19/95	10:24	33	20:39	812.6	0.7
7/45	11/30/94	02/07/95	07:43	02/24/95	12:31	17	04:48	412.8	1.4
7/85	03/14/95	04/01/95	20:30	04/06/95	21:34	5	01:04	121.1	4.7
7/88	03/13/95	03/26/95	12:11	03/29/95	12:59	3	00:48	72.8	7.8
7/81	*03106195*	03/31/95	03:27	04/03/95	10:06	3	06:39	78.65	7.2
7/82	03/06/95	04/04/95	16:50	04/09/95	20:56	5	04:06	124.1	4.6
7/13	03/30/95	04/21/95	18:29	04/26/95	20:42	5	02:13	122.2	4.6
							Avg:	262.2	4.1

1995–96

Ch/Code	Rel. Date	Stanfield Last Date	Stanfield Last Time	ODFW First Date	ODFW First Time	Days	Stan. to ODFW Passage Hrs/Min	Total Hours	Miles/Day
7/9	03/27/96	04/02/96	*09: 30*	04/06/96	09:32	4	00:02	96.03	5.9
7/100	03/21/96	04/02/96	23:31	04/08/96	07:13	5	07:42	127.7	4.4
13/30	01/16/96	03/14/96	09:19	03/19/96	10:54	5	01:35	121.6	4.7
7/4	03/07/96	03/23/96	12:41	03/31/96	13:38	a	00:57	192.9	2.9
7/69	10/17/95	03/11/96	09:15	03/16/96	23:57	5	14:42	134.7	4.2
13/15	01/03/96	02/25/96	10:31	03/09/96	01:57	12	15:26	303.4	1.9
7/66	10/31/95	03/03/96	14:46	03/09/96	16:30	6	01:44	145.7	3.9
7/1	02/27/96	03/11/96	12:oo	03/19/96	01:37	7	13:37	181.6	3.1
7/15	03/19/96	04106196	07:43	04/08/96	03:46	1	20:03	44.05	12.9
7/29	04/01/96	04106196	06:33	04/09/96	05:26	2	22:53	70.88	a.0
7/93	03/05/96	04/06/96	12:30	04/09/96	11:24	2	22:54	70.9	a.0
7/46	04/09/96	04/18/96	01:22	04/23/96	13:13	5	11:51	131.9	4.3
file name:9396#1							Avg:	135.1	5.3

Table H-l 1: Spring Chinook Salmon passage times (days, hours, minutes) and miles moved per day between the release site (Bamhart) and ODFW (RM 56). Upstream Transport Evaluation, Umatilla River, 1994 and 1996. No data available for 1995.

1994

		Release		ODFW First			Rel. Site to ODFW	Total	
Ch/Code	Release Site	Date	Time	Date	Time	Days	Hrs/Min	Hours	Miles/Da
13/21	Barnhart	05/02/94	11:30	05/05/94	23:01	3	11:31	83.5	4
13/22	Bamhart	05/06/94	11:00	05/10194	03:28	3	16:28	88.5	3
13/44	Barnhart	05/10194	13:30	05/12/94	23:03	2	09:33	57.6	5
13/15	Barnhart	05/13/94	15:00	05/16/94	01:19	2	10:19	58.3	5
							Avg:	72.0	4

1996

		Release					Rel. Site to ODFW	Total	
Ch/Code	Release Site	Date	Time	Date	Time	Days	Hrs/Min	Hours	Miles/Da
13/52	Bamhart	04130196	11:45	05/06/96	04:38	5	16:53	136.9	2
13/83	Barnhart	05/02/96	11:15	05/12/96	0538	9	18:23	234.4	1
13/86	Bamhart	05/02/96	11:15	05/11196	00:15	8	13:00	205.0	1
13/55	Barnhatt	05/06/96	II:oo	05/09/96	14:12	3	03:12	75.2	4
13/95	Barnhart	05106196	II:oo	05/09/96	20:39	3	09:39	81.7	4
7/82	Barnhart	05/07/96	11:30	05/18/96	01:52	10	14:22	254.4	1
7/91	Barnhart	05/07/96	11:30	05/13/96	10:59	5	23:29	143.5	2
7/9	Bamhart	05/09/96	12:15	05/11196	11:56	1	23:41	47.7	6
7/90	Barnhart	05/09/96	12:15	05/11196	20:50	2	08:35	56.6	5
7/88	Bamhart	05110196	12:30	05/12/96	17:01	2	04:31	52.5	6
7/89	Bamhart	05/10196	12:30	05/12/96	17:00	2	04:30	52.5	6
file name: t&hchs							Avg:	121.8	3

Table H-12: Spring Chinook Salmon passage times (days, hours, minutes) and miles moved per day between Stanfield Dam and ODFW (RM 56), Passage Evaluation, Umatilla River, 1999-96.

1994

Ch/Code	Release Date	Stanfield Last Date	Stanfield Last Time	ODFW First Date	ODFW First Time	Stan. to ODFW Passage Days	Stan. to ODFW Passage Hrs/Min	Total Hours	Miles/Day
13/14	04/14/94	04/20/94	10:20	04/24/94	07:34	3	21:14	93.23	6.1
13/17	04/27/94	05/06/94	04:41	05/08/94	22:03	2	17:22	65.37	8.7
13/18	04/29/94	05/23/94	17:39	05/25/94	17:06	1	23:27	47.45	11.9
							Avg:	66.68	0.9

1995

Ch/Code	Release Date	Stanfield Last Date	Stanfield Last Time	ODFW First Date	ODFW First Time	Stan. to ODFW Passage Days	Stan. to ODFW Passage Hrs/Min	Total Hours	Miles/Day
13/32	04/10/95	04/24/95	16:40	05/08/95	04:11	13	11:31	323.5	1.8
13/34	04/11/95	04/25/95	14:oo	05/03/95	18:21	8	04:21	196.4	2.9
13/36	04/13/95	04/25/95	13:04	05/16/95	02:44	20	13:40	493.7	1.1
13/38	04/18/95	04/25/95	01:39	05/08/95	16:14	13	14:35	326.6	1.7
13/40	04/20/95	04/24/95	08:57	04/27/95	04:07	2	19:10	67.17	8.4
13/31	04124195	04/28/95	23:39	05/18/95	18:34	19	18:55	474.9	1.2
13/35	04/13/95	05/02/95	11:35	05/19/95	02:23	16	14:48	398.8	1.4
13/43	04/24/95	05/22/95	11:14	05/24/95	13:39	2	02:25	50.42	11.2
13/42	04126195	05/19/95	14:36	05/24/95	02:51	4	12:15	108.2	5.2
							Avg:	271 .1	3.9

1996

Ch/Code	Release Date	Stanfield Last Date	Stanfield Last Time	ODFW First Date	ODFW First Time	Stan. to ODFW Passage Days	Stan. to ODFW Passage Hrs/Min	Total Hours	Miles/Day
13/05	04/15/96	04122196	22:51	65106196	00:52	13	02:01	314.0	1.8
13/32	04/16/96	05/19/96	10:57	05/21/96	15:03	2	04:06	52.1	10.9
13/34	04/17/96	05127196	06:07	05/28/96	15:44	1	09:37	33.6	16.8
13/38	04122196	05102196	18:21	05/07/96	02:39	4	08:18	104.3	5.4
13/43	04/30/96	05/12/96	19:52	05/16/96	17:40	3	21:48	93.8	6.0
13/61	04/30/96	05/08/96	23:22	05/11/96	13:23	2	14:01	62.0	9.1
13/58	04/30/96	05/07/96	02:57	05/10/96	14:53	3	11:56	83.9	6.7
13/68	05/02/96	05/09/96	16:27	05/14/96	11:33	4	19:06	115.1	4.9
13/98	05/06/96	05/12/96	19:18	05/15/96	14:58	2	19:40	67.7	8.4
7/83	05/07/96	05/13/96	01:38	05/15/96	17:56	2	16:18	64.3	8.8
7/81	05/07/96	05/11/96	14:15	05/13/96	20:50	2	06:35	54.6	10.4
7/86	05115196	05/21/96	05:05	05/25/96	05:27	4	00:22	96.4	5.9
13/74	05102196	05/16/96	15:09	05/21/96	11:56	4	20:47	116.8	4.9
file name: 9395#2							**Avg:**	**96.81**	7.7

Table H-I 3: Fall chinook salmon mainstem passage data at John Day, McNary, and Ice Harbor Dams, 1990-93.

		Aug 1-15		Aug 16-31		Sep 1-15		Sep 16-30		Oct 1-15		Oct 16-31		
Year	Dam	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Total No.
1990	John Day	2147	2.3	11223	12	49115	52.7	22393	24	6663	7.1	16521	1.8	93193
	McNary	2686	3.3	4504	5.5	40375	49.2	21343	26	10037	12.2	3053	3.7	81998
	Ice Harbor	102	1.9	202	3.7	1716	31.8	1598	29.6	1169	21.7	604	11.2	5391
1991	John Day	1132	1.4	3653	4.5	34358	42.7	30592	38	8434	10.5	2341	2.9	80510
	McNary	1340	1.8	2832	3.8	25055	33.9	31196	42.2	10638	14.4	2872	3.9	73933
	Ice Ha&or	87	1.4	54	0.9	1989	32.5	2064	33.7	1367	22.3	563	9.2	6124
1992	John Day	1225	1.7	6320	8.6	33363	45.5	24777	33.8	6160	8.4	1413	1.09	73258
	McNary	1470	2.1	4294	6	26679	37.3	25282	35.3	11602	16.2	2280	3.2	71607
	Ice Harbor	67	1.2	156	2.8	1732	31.1	1984	35.6	1078	19.3	556	10	5573
1993	John Day	1761	2.6	8828	13	29623	43.9	22044	32.7	3805	5.6	1411	2.1	67472
	McNary	2137	3.3	6098	9.5	28042	43.6	20051	31.2	6182	9.6	1820	2.8	64327
	Ice Harbor	132	4.1	199	6.2	988	30.7	1099	34.1	539	16.7	262	8.1	3219
Total	John Day	6265	2	30024	9.5	146459	46.6	99806	31.7	25062	8	6817	2.2	314433
	McNary	7630	2.6	17728	6.1	12011	41.2	97872	33.5	38459	13.2	10025	3.4	291865
	Ice Harbor	388	1.9	611	3	6425	31.6	6745	33.2	4153	20.5	1985	9.8	20307

ile name: chfmnstm

Table H-14: Percent of Fall Chinook Salmon (mini-jacks not included) homing to the Umatilla River versus straying into fish hatcheries and spawning grounds above McNary Dam. Average attraction flows exiting the Umatilla River during September also included. Numbers represent estimated CWT recoveries from both yearling and subyearling releases.

Recovery Year	No. Above McNary	No. to Uma. R.	Total No.	Percent Home	Percent Stray	Avg. Flow Sept 1-15	Avg. Flow Sept 16-30
1990	152	224	376	59.6	40.4	4 cfs	21 cfs
1991	182	144	326	44.2	55.8	50 cfs	130 cfs
1992	93	29	122	23.8	76.2	1.5 cfs	1 cfs
1993	76	44	120	36.7	63.3	78 cfs	100 cfs
1994	88	113	201	56.2	43.8	59 cfs	62 cfs
1995	47	98	145	67.6	32.4	83 cfs	123 cfs

Table H-15: Umatilla River fall chinook salmon homing and straying rates for acclimated (Minthorn) versus direct (near Minthorn) releases. Numbers represent estimated coded-wire tag recoveries.

Brood Yr.	Tag Code	Rel. Loc.	No. Tagged	Rel. Age	No. Above McNary	No. to Uma. R.	Percent Home	Percent Stray
87	539-41	Minthorn	13260	o++	6	2	25.0	75.0
87	536-38	Nr. Minthorn	73148	o++	24	49	67.1	32.9
88	753,54,57	Minthorn	76824	o++	11	13	54.2	45.8
88	758,60,63	Nr. Minthorn	76425	o++	11	9	45.0	55.0
89	325-27	Minthorn	66426	o++	2	7	77.8	22.2
89	322-24	Nr. Minthorn	70450	o++	4	1	20.0	80.0
90	563,601,602	Minthorn	76411	o+	15	15	50.0	50.0
90	560–62	Nr. Minthorn	73454	o+	20	14	41.2	58.8

file name: 9495chfl

Table H-16: Umatilla River homing and straying data for yearling (1+) fall chinook salmon (includes acclim releases). Numbers represent estimated coded-wire tag recoveries.

Brood Yr.	Tag Code	Rel. Loc.	No. Tagged	Rel. Age	No. Above McNary	No. To Uma. R.	% home	% stray
84	073327	Bon/Minth	88396	1+	102	55	35.0	65.0
85	073823 -27	Minthorn	49635	1+	53	100	65.4	34.6
85	073828 – 32	Bonifer	50492	1+	36	63	63.6	36.4
86	074038 -39	Minthorn	81046	1+	67	233	77.7	22.3
86	074036 -37	Bonifer	77914	1+	39	170	81.3	18.7
91	071460,461	RM 73.5	47102	1+	2	5	71.4	28.6
91	071460 -61	RM 73.5	47102	1+	2	4	86.7	33.3

Table H-17: Umatilla River homing and straying data for sub-yearling (O+,O++) fall chinook salmon (inch and direct releases). Numbers represent estimated coded-wire tag recoveries.

Brood Yr.	Tag Code	Rel. Loc.	No. Tagged	Rel. Age	No. Above McNary	No. To Uma. R.	% home	% stray
89	075403 -05	RM 70-79	159020	0+	68	12	15.0	85.0
89	075325 -27	Minthorn	66426	0++	2	5	71.4	28.6
89	075322 -24	Nr. Mintorn	70450	o++	4	1	20.0	80.0
90	075563,601–02	Minthorn	76411	o+	61	21	25.6	74.4
90	075560 -62	Nr. Minthorn	73454	o+	23	17	42.5	57.5
91	071429 -38	RM 42.5	304968	o+	0	3	100.0	0.0
90	075225, 26 328, 449-51 , 016	RM 70-79	103980	o+	280	107	27.6	72.4

file name:9495chf2

Table H-18: Umatilla River homing and straying data for coho salmon. Numbers represent estimated CWT recoveries only.

Brood Yr.	Tag Code	No. Tagged	Rel. Location	No. to Uma. R.	No. to Cascade	No. to Other	Percent Home	Percent Stray
87	074609	27062	Nr. Minthorn	19	4	0	82.6	17.4
87	74610-I 1	53155	Minthorn	75	18	2	78.9	21.1
88	074814-15	55259	Minthorn	175	93	32	58.3	41.7
88	074813	26881	RM 63-70	72	22	14	66.7	33.3
89	075535	24584	Minthorn	6	0	0	100.0	0.0
89	075534	25338	RM 56-60	8	3	0	72.7	27.3
89	075533	25407	RM 63-70	12	0	0	100.0	0.0
90	075620	27908	RM 56	45	12	2	76.3	23.7
90	075621-22	55163	RM 60	119	31	4	77.3	22.7
91	071521	28273	RM 60	36	3	0	92.3	7.7
91	071522-23	55805	RM 42	77	15	0	83.7	16.3
92	070337 -39	81628	RM 42&60	117	10	1	91.4	8.6

Table H-19: Umatilla River coho salmon homing and straying data for acclimated versus direct releases. Numbers represent estimated CWT recoveries.

Brood Yr.	Tag Code	No. Tagged	Rel. Location	No. to Uma. R.	No. to Other	Total No.	Percent Home	Percent Stray
87	074609	27062	Nr. Minthorn	19	4	23	41.3	58.7
87	074610-I 1	53155	Minthorn	75	20	95	39.5	60.5
88	074814-15	55259	Minthorn	175	125	300	29.2	70.8
88	074813	26881	Nr. Minthorn	72	36	108	33.3	66.7
89	075535	24584	Minthorn	6	0	6	50.0	50.0
89	075534	25338	RM 56-60	8	3	11	36.4	63.6
89	075533	24851	RM 63-70	12	0	12	50.0	50.0

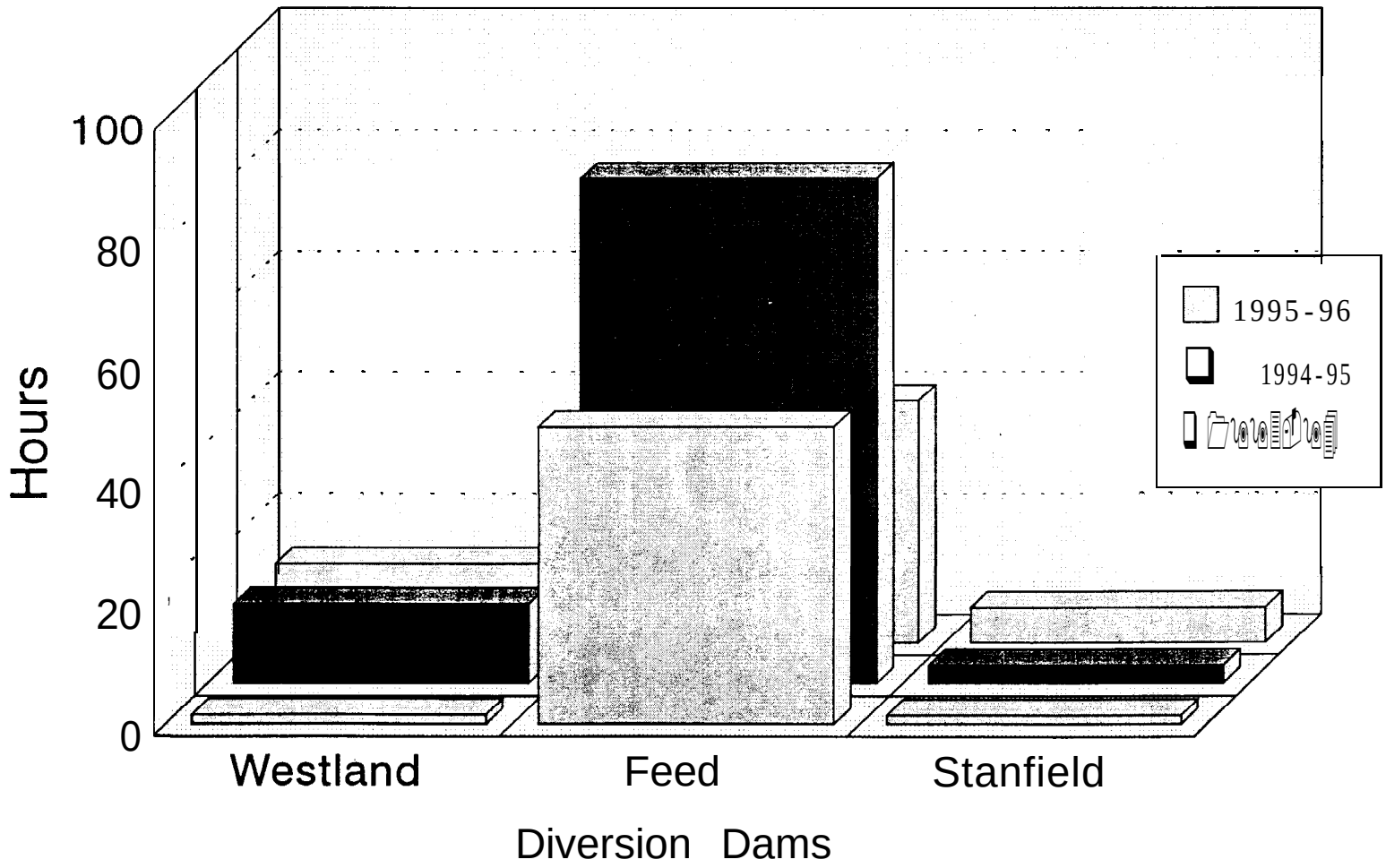
file name: 9495chol

Piyure H-l.

Summer Steelhead Mean Passage Times

for Westland, Feed, and Stanfield Diversion Dams

Umatilla River, 1993-96



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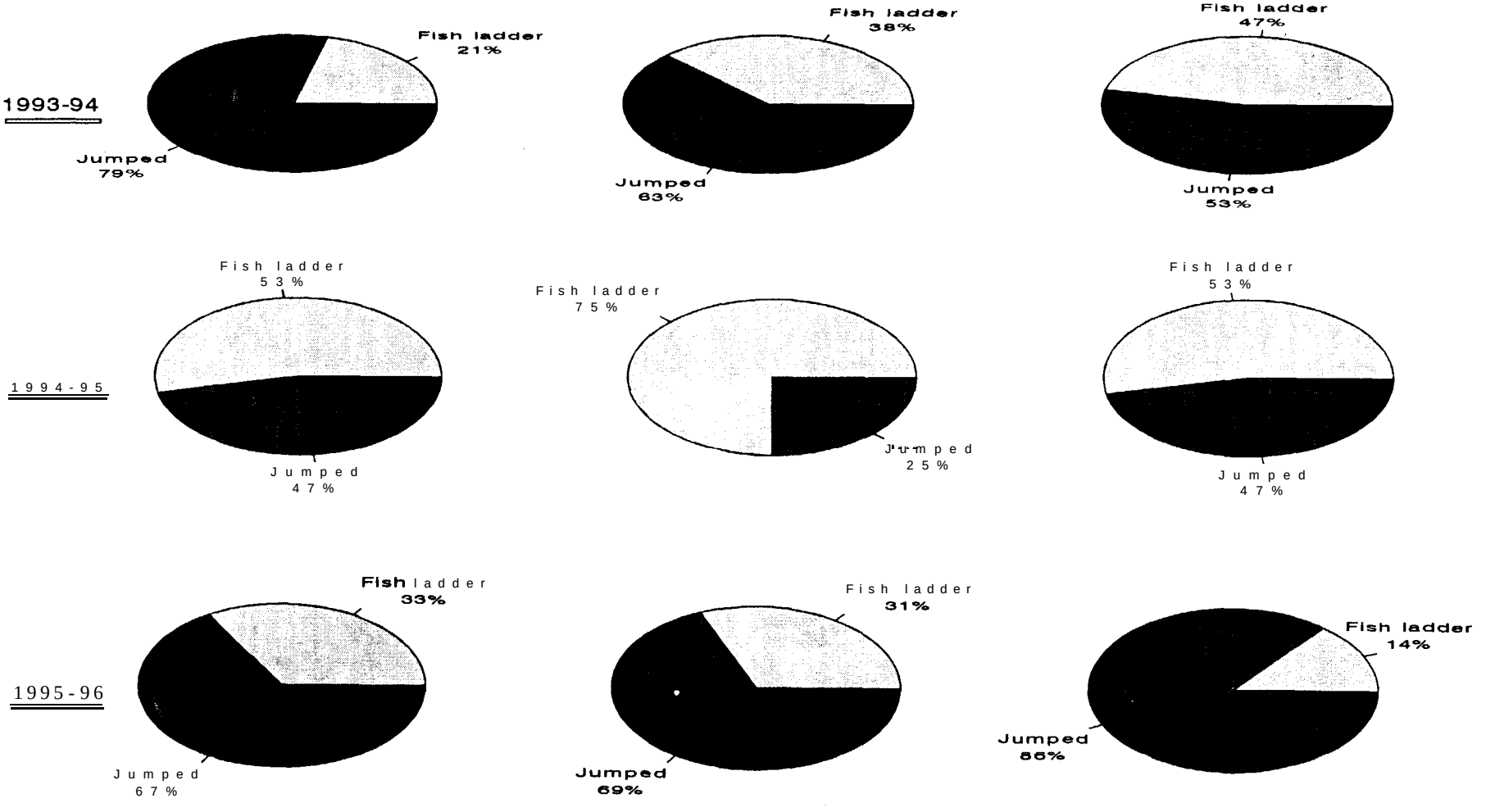


Figure H-2: Summer Steelhead migrational routes for Westland, Feed Canal, and Stanfield Dams, Umatilia River, 1993-96.

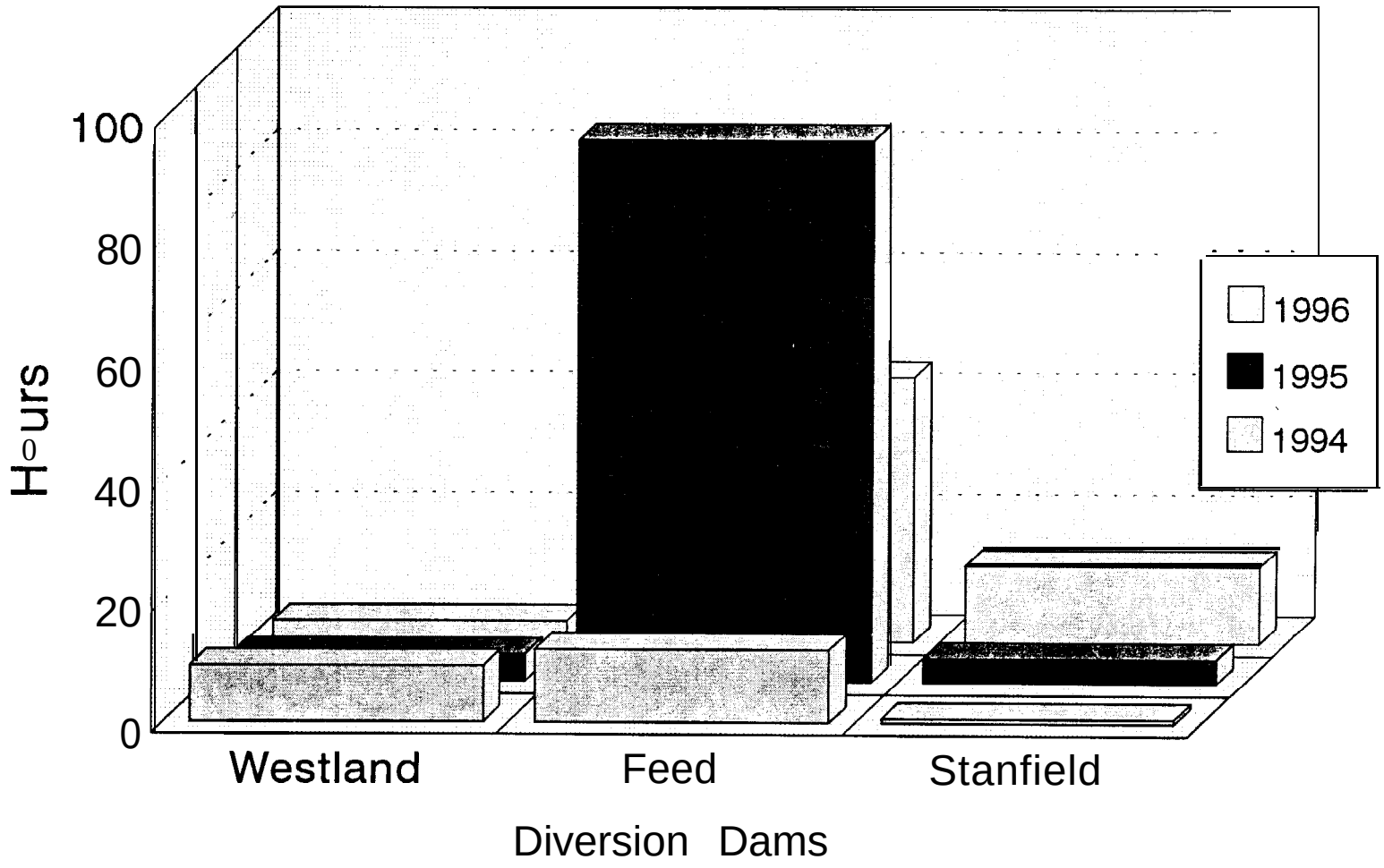
File name: ladder2

Figure H-3.

Spring Chinook Mean Passage Times

for Westland, Feed, and Stanfield Diversion Dams

Umatilla River, 1994-96



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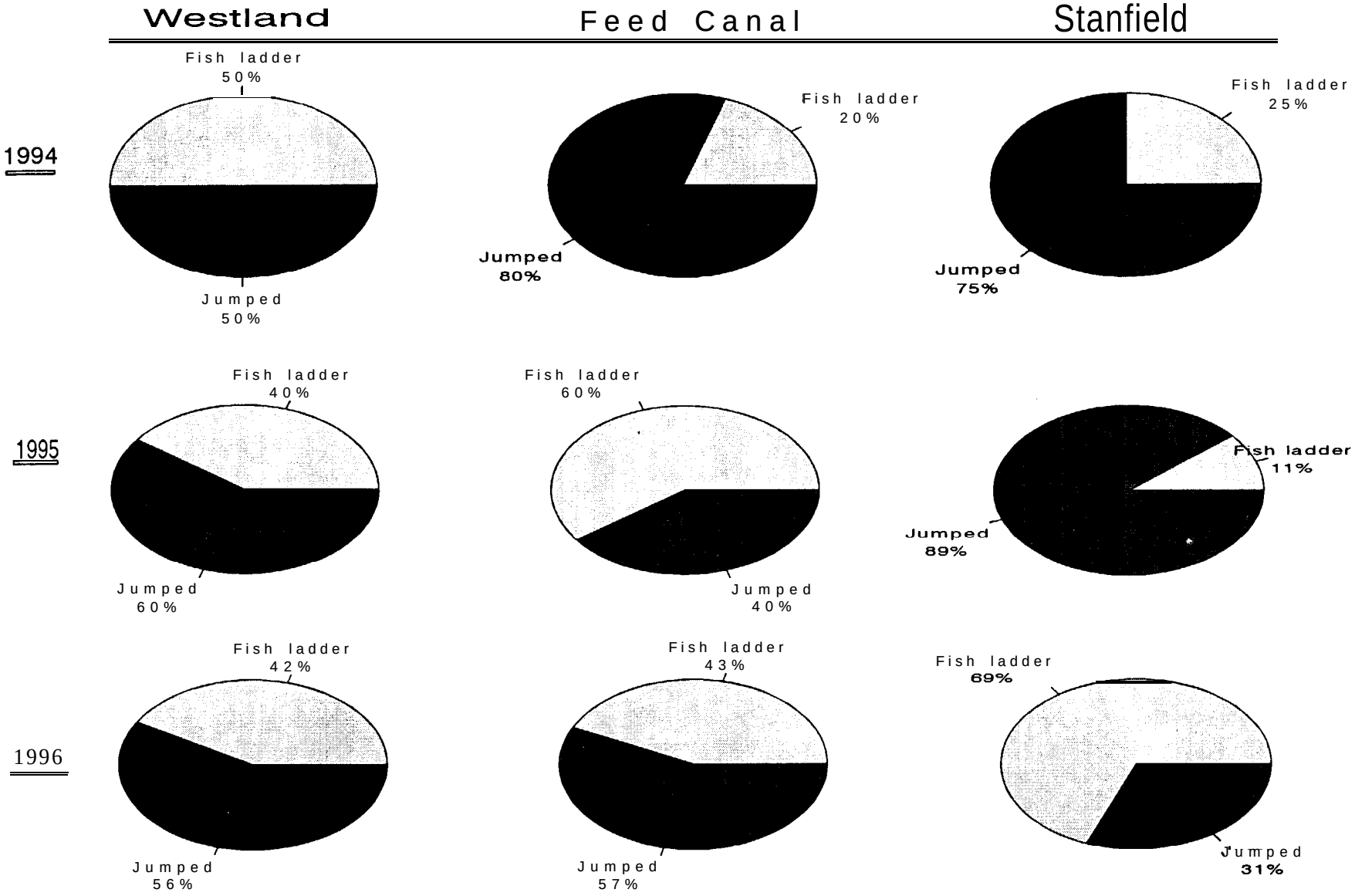


Figure H-4. Spring Chinook migrational routes for Westland, Feed and Stanfield Dams, 1994-96.
File name: **ladder#1**

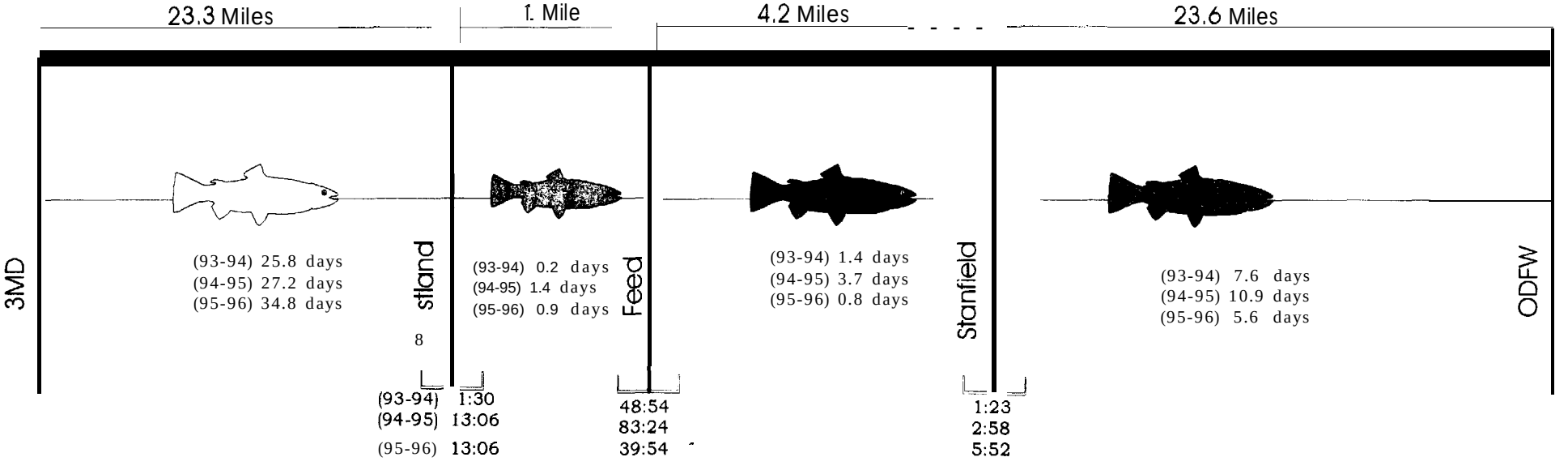
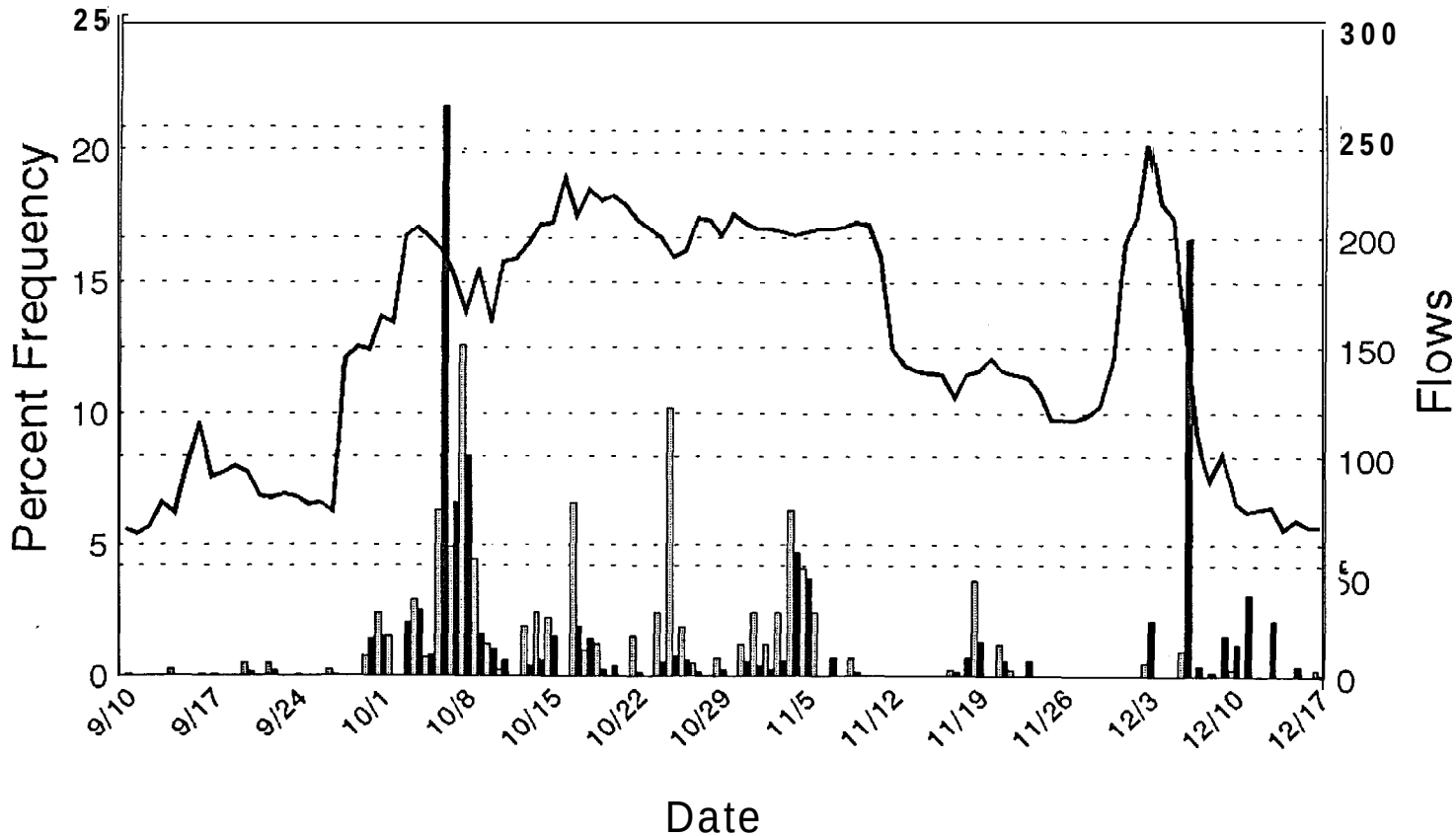


Figure H-5. Radio telemetry data with average migrational times for Summer Steelhead between dams (days) versus passage times over dams (hours and minutes), Umatilla River 1993-1996.

Figure H-4.

Fall Chinook and Coho Returns Versus Flows

Umatilla River 1993

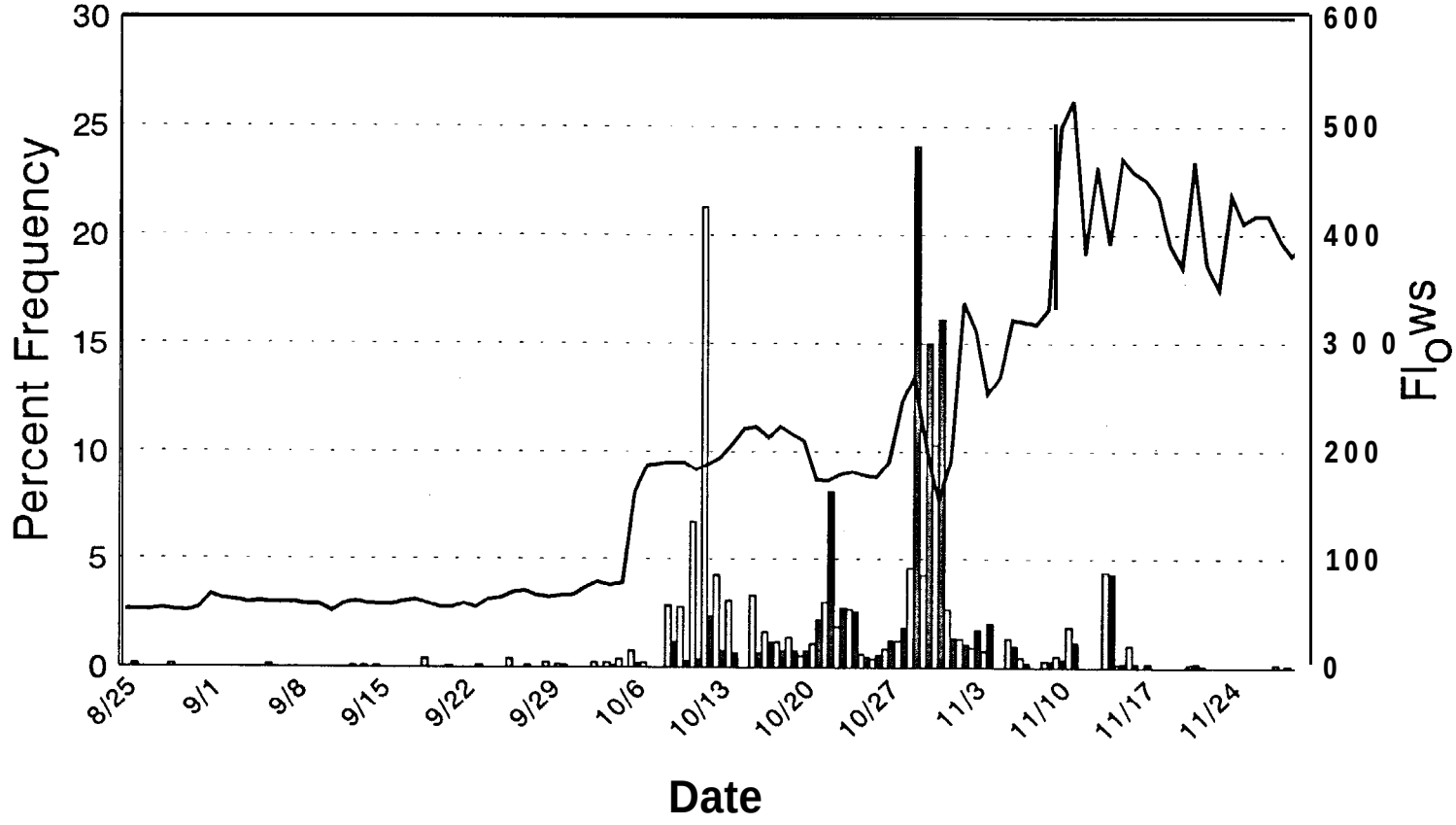


File name: 93chfflw

Figure H-7

Fall Chinook and Coho Returns Versus Flows

Umatilla River 1994

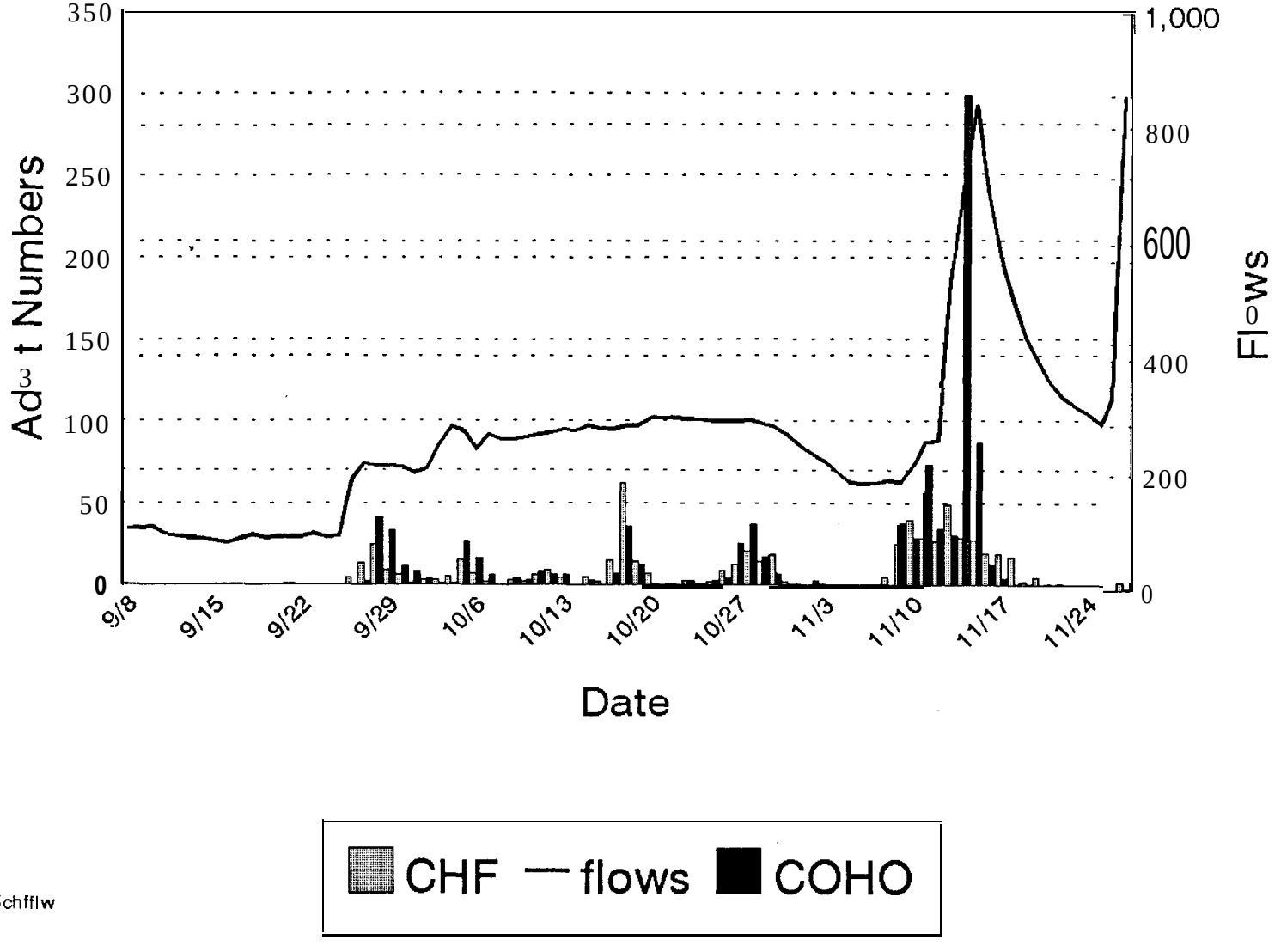


File name: 94chfflw

Figure H-8.

Fall Chinook and Coho Returns Versus Flows

Umatilla River 1995

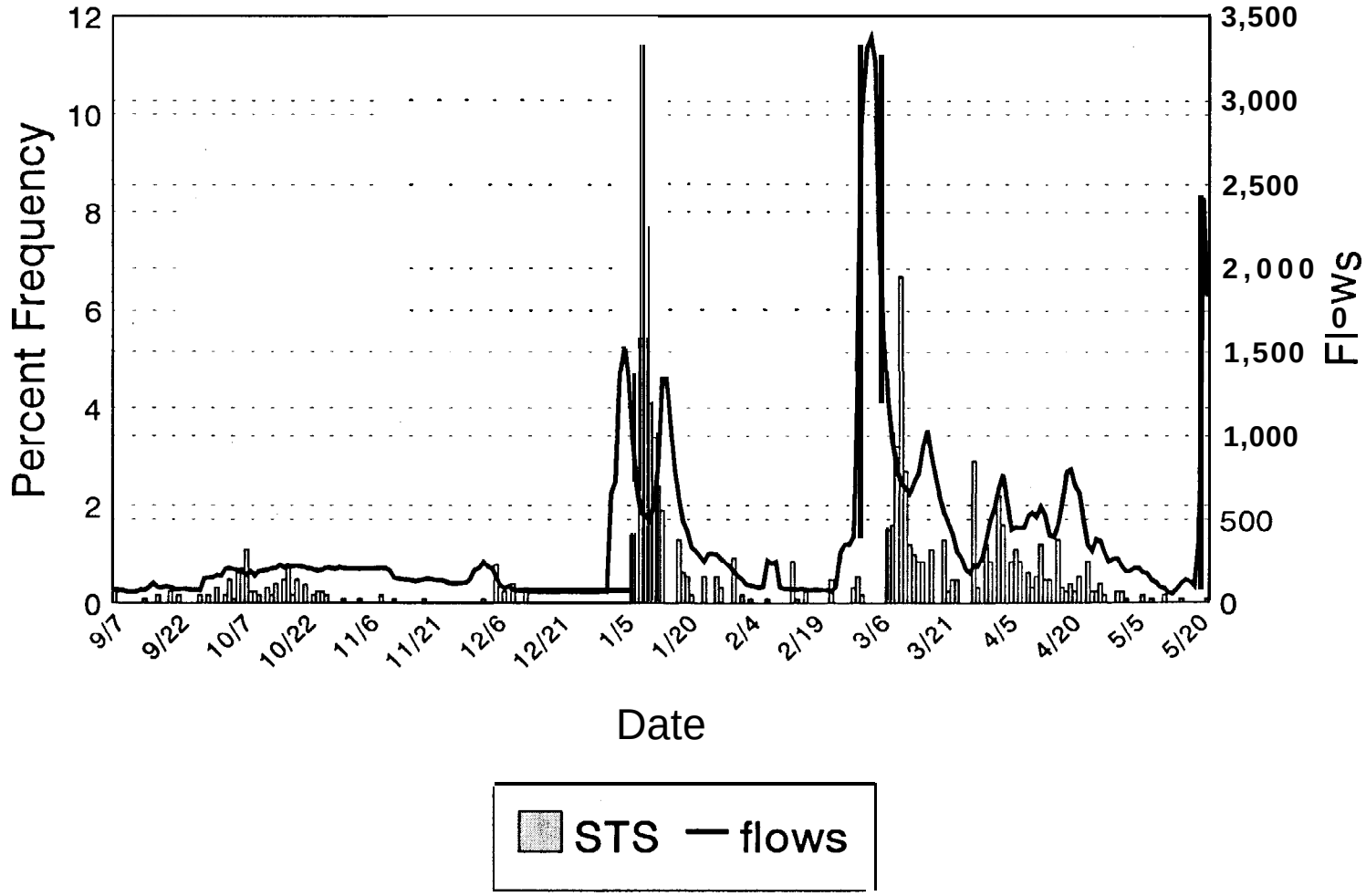


File name: 95chfflw

Figure H-9.

Summer Steelhead Returns Versus Flows

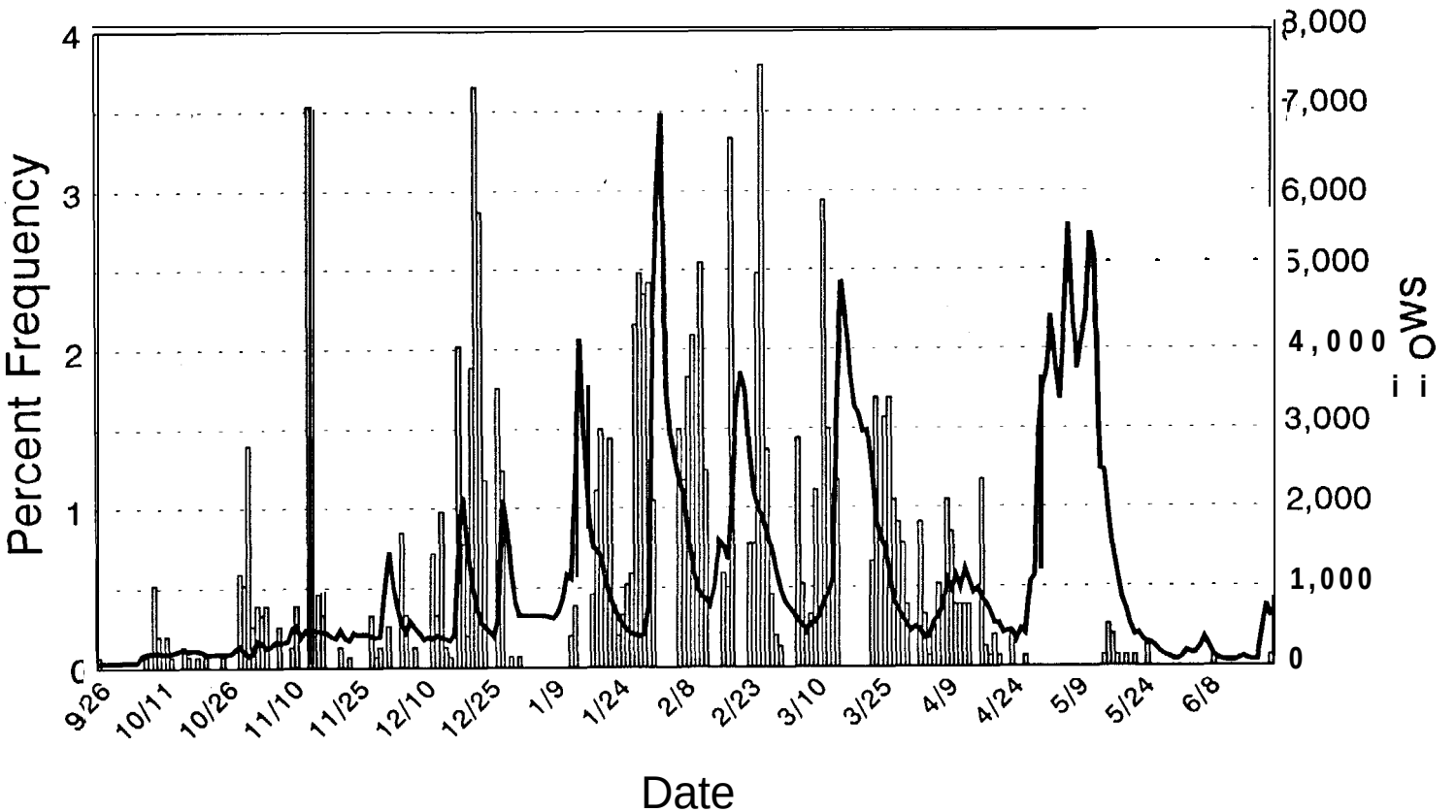
Umatilla River 1993-94



File name: 94stsflw

Figure H- 10.

Summer Steelhead Returns Versus Flows
Umatilla River 1994-95

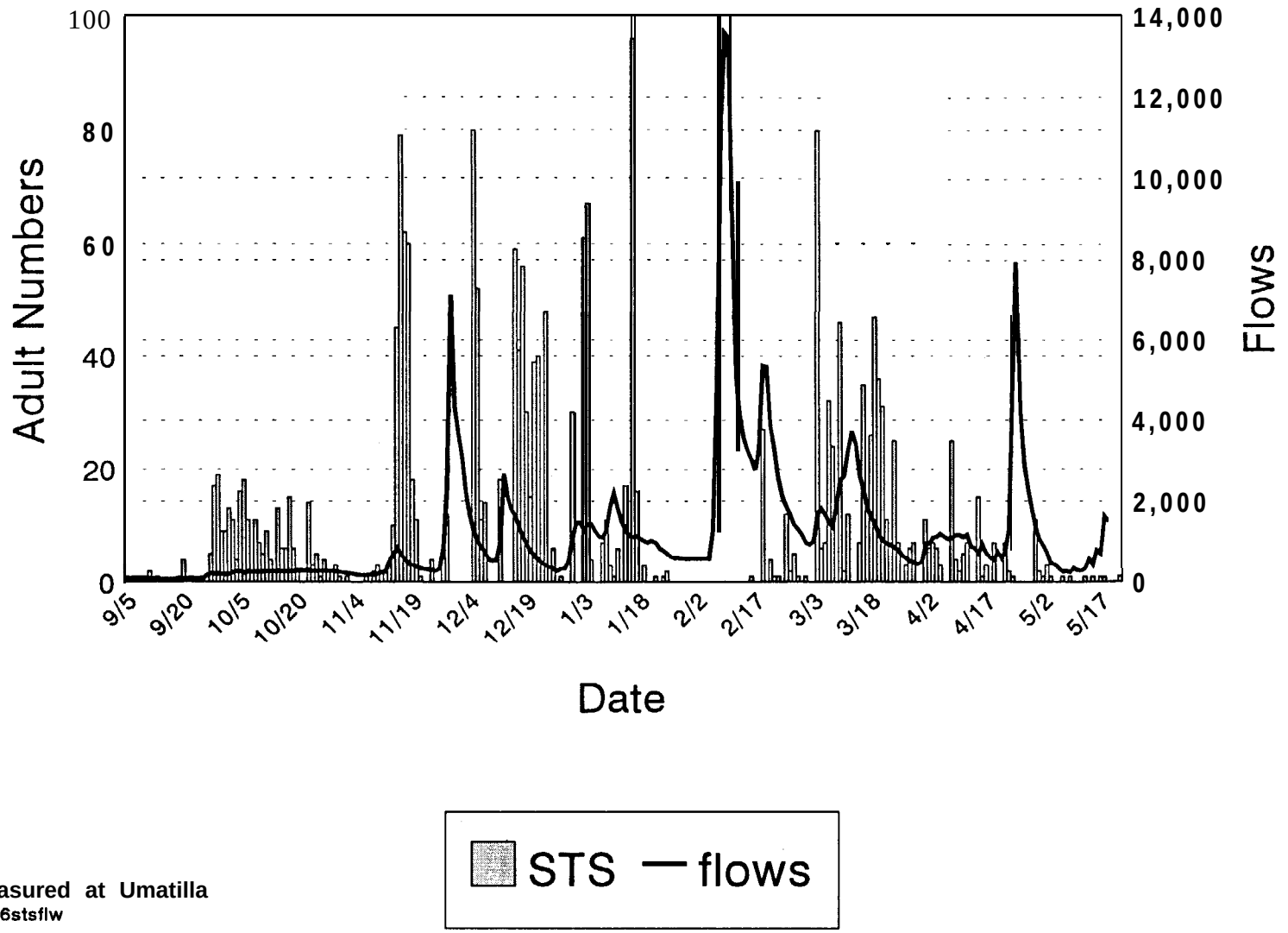


Flows measured at Umatilla
File name: 95stsflw

Figure H-11.

Summer Steelhead Returns Versus Flows

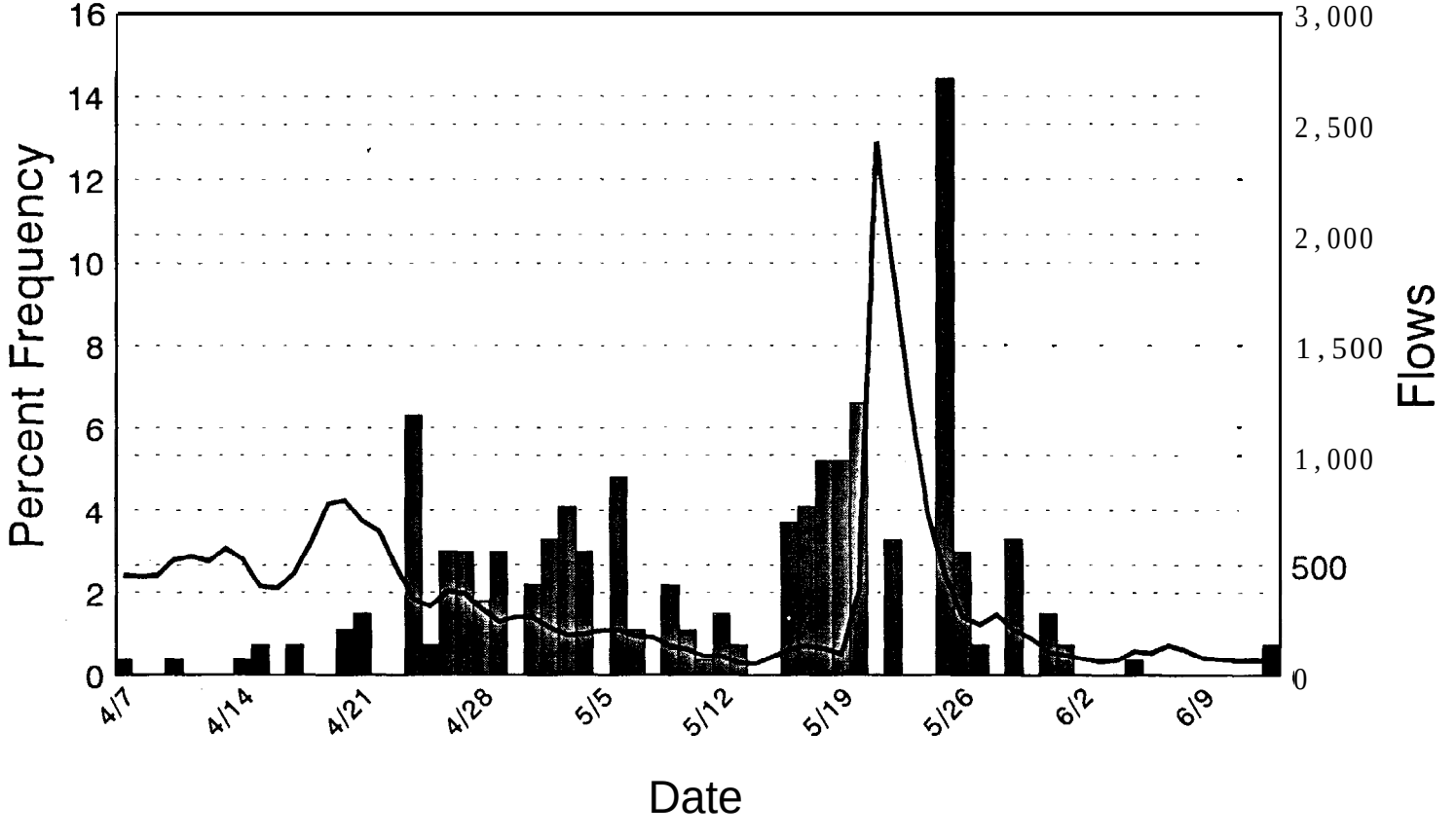
Umatilla River 199596



Flows measured at Umatilla
File name: 96stsflw

Figure H- 12.

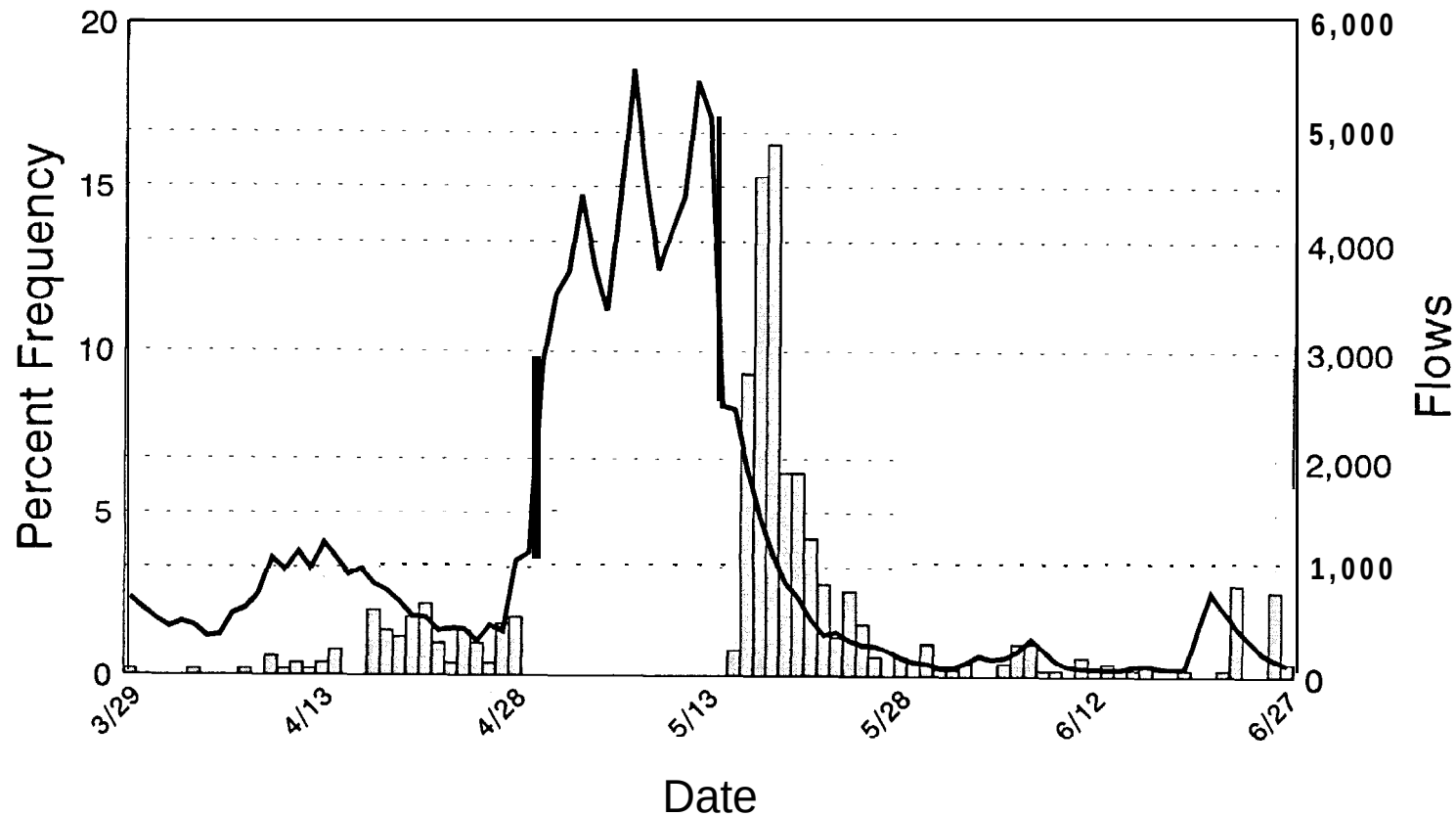
Spring Chinook Salmon Versus Flows
Umatilla River 1994



File name: 94chsflw

Figure H-13.

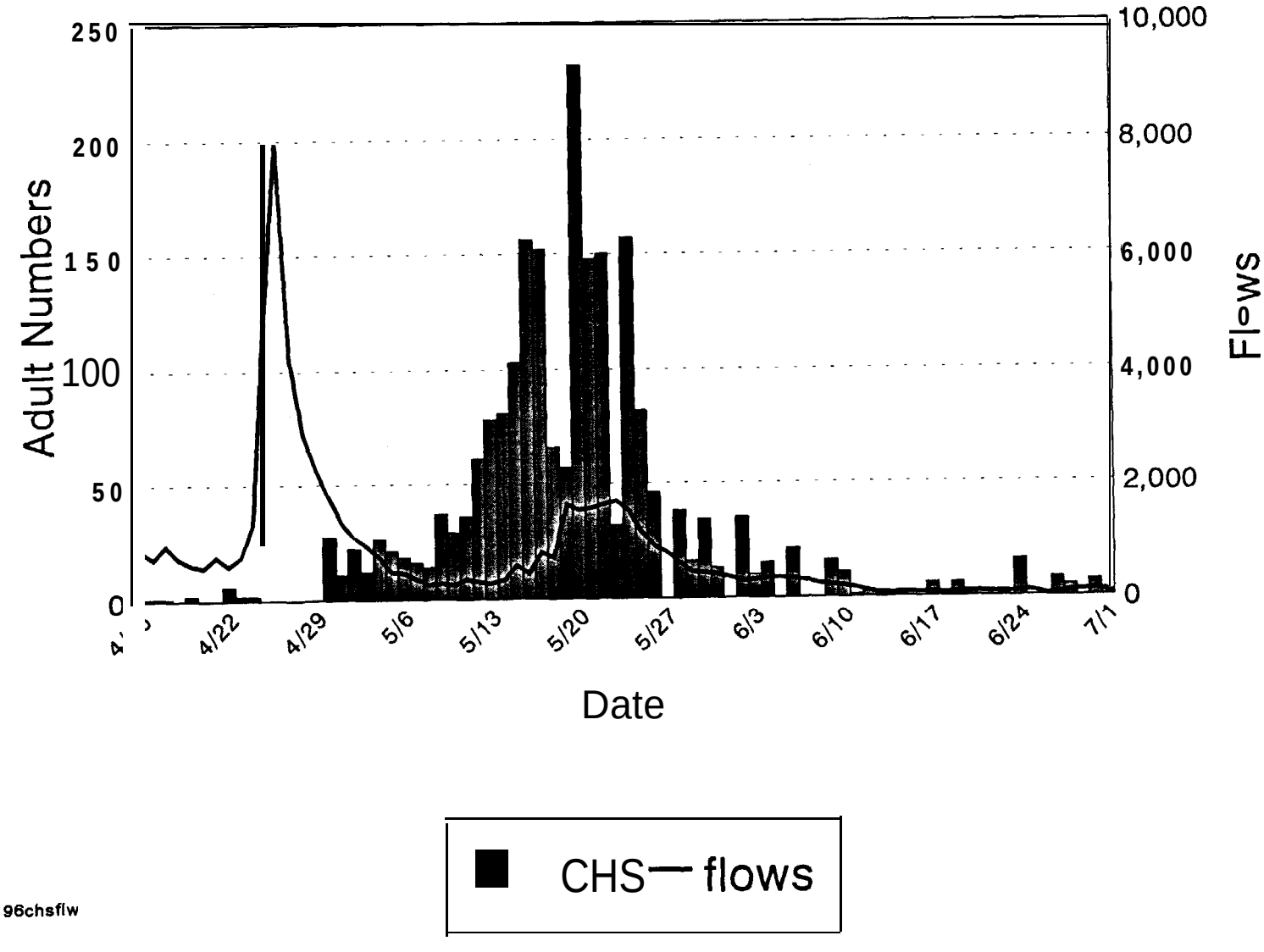
Spring Chinook Salmon Versus Flows
Umatilla River 1995



Flows measured at Umatilla
File name: 95chsflw

Figure H-14.

Spring Chinook Salmon Versus Flows
Umatilla River 1996



File name: 96chsflw

APPENDIX I

Table I-l. Summary of Landmarks and their Associated River Miles, Umatilla River Basin.

Location / Landmark	RM	Location / Landmark	RM
Three Mile Falls Dam	3.7	Gibbon Railroad Yard	78.4
Horse Ranch	5.0	Mouth Of Meacham Creek	79.0
Tree Farm	5.5	Imeques C-mem-ini-kern	79.5
House on Bluff	7.4	Fred Gray's Bridge	80.0
South Park Bridge	8.8	Emmit Wiiiams Place	81.1
Boyd's Return	9.0	London Bridge	81.4
Boyd's Dam	10.2	Reservation Boundary-Ryan Creek	81.8
Lookinglass Road	11.3	Larson's Driveway	83.1
Maxwell Dam	15.2	Stage Coach Stop House	84.8
Simplot	17.0	Bar M Driveway	85.9
Stanfield Bridge	23.0	Bear Creek	86.8
I-84 Bridge	24.2	Old Silver Building	87.1
Dillon Dam	24.6	Corporation Hole	88.5
Echo Bridge	26.3	Umatilla Mainstem Forks	89.5
Westland Dam	27.2	North Fork Umatilla River	O-10
Coldsprings Dam	28.2	Coyote Creek	2.5
Stanfield Dam	32.4	Woodward Creek	5.7
Yoakum	37.0	South Fork Umatilla River	O-10
Barnhart Bridge	42.2	Buck Creek	0.5
Forth's Diversion	46.9	Thomas Creek	3.3
Mouth of Birch Creek	48.3	Shimmiehom Creek	4.6
PGG Building	51.0	Meacham Creek	O-36
ODFW, Receiver Site #4	56.0	Boston Canyon Creek	2.2
Pendleton Ready Mix	57.0	Bonifer Acclimation Site	2.3
Mission Bridge	59.5	Line Creek	5.0
Minthom Springs	64.5	Camp Creek	10.9
Cayuse Railroad Bridge	67.0	Duncan	12.0
Cayuse Highway Bridge	67.5	North Fork Meacham Creek	15.0
Louie Dick's Fence	70.0	East Meacham Creek	18.5
Thornhollow Railroad Bridge	71.0	Butcher Creek	21.5
Badger Comer	71.8	Meacham	30.0
Thornhollow Highway Bridge	73.5	North Fork Meacham Creek	o-9.5
Withers	74.5	Bear Creek	3.0
Mouth of Squaw Creek	76.7	Pot Creek	5.2

Table I-2. Abbreviations Used in this Paper.

BOR	US Bureau of Reclamation
BPA	Bonneville Power Administration
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWT	Coded-Wire Tags
DEQ	Department of Environmental Quality
MEHP	Mid-eye to Hypural Plate
NPPC	Northwest Power Planning Council
ODFW	Oregon Department of Fish and Wildlife
RM	River Mile
TMD	Three Mile Dam
USFS	US Forest Service
USGS	US Geological Survey
UBNPME	Umatilla Basin Natural Production Monitoring and Evaluation

Bonneville Power Administration

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